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NATURAL HISTORY TRANSACTIONS

OF

NORTHUMBERLAND AND DURHAM;

BEING PAPERS READ AT THE

MEETINGS OF THE NATURAL HISTORY SOCIETY

OF

NORTHUMBERLAND, DURHAM, AND NEWCASTLE-UPON-TYNE,

AND THE

TYNESIDE NATURALISTS' FIELD CLUB,

1865-67.

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S-ES-N

THE Committees of the two Societies beg to state that the Authors alone are responsible for the facts and opinions entertained in their respective papers.

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THE Natural History Transactions of Northumberland and Durham, of which this forms the first part, are to be looked upon as a continuation of the "Transactions of the Tyneside Naturalists' Field Club" under a different title, being in fact the Proceedings of the "Natural History Society of Northumberland, Durham, and Newcastle-upon-Tyne" incorporated with those of the Tyneside Naturalists' Field Club.

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NATURAL HISTORY

TRANSACTIONS

OF

NORTHUMBERLAND AND DURHAM.

I.—*Reports of Deep Sea Dredging on the Coasts of Northumberland and Durham*, 1862–4. Edited by GEORGE S. BRADY. (Plates I–VII, X.)

IT is, doubtless, well known to most of our members that, during three successive years, grants of money have been made by the British Association, for the purpose of prosecuting deep sea dredging on the Dogger Bank and the coasts of Northumberland and Durham. The amount granted was £25 each year, but in 1863 only a portion of the grant (about £17) was expended, while in other years the original amount was considerably increased by grants from the Natural History Society and the Field Club, as well as by private contributions, so that an aggregate of nearly £120 has been expended on the three years' operations. The proper appropriation of money thus granted involves, of course, a considerable amount of hard work, and brings with it not a little responsibility and anxiety to those who are entrusted with it. The elements are capricious, particularly upon this exposed north-eastern coast. We are often kept waiting week after week on the look-out for a smooth sea and favourable winds, and when at last we fancy that we have surely got into a seam of fine settled weather, we venture out some balmy morning on the glassy

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sea, but before noon a gale comes on, and there is nothing for it but to haul up the dredges, toss about for a while in the hope of a lull, or, in mute despair, to run at once for land. Considering these things, and remembering also, that having been favoured with three grants, we have had perhaps as much as it would be decent, for the present, to ask, no application for further pecuniary aid was made to the last meeting of the Association. It has therefore been thought desirable to give in this concluding report a complete *resumé* of the results of the three years' dredging. In the first place, however, we shall recount briefly the work which has been done during the present year.

In the course of the summer eight days were spent in dredging, two of these on the Durham coast, and six off the northern shores of Northumberland. The two days devoted to the Durham coast were most unfortunate ones: on each occasion the earlier part of the day appeared favourable, but before mid-day the wind had freshened to a gale and quite put a stop to all work, once at least resulting in the complete rout and "demoralization" of the dredging party.

"We had had enough of action, and of motion we,
Roll'd to starboard, roll'd to larboard, when the surge was seething free,
Where the wallowing monster spouted his foam-fountains in the sea.

* * * *

Surely, surely, slumber is more sweet than toil, the shore
Than labour in the deep mid-ocean, wind and wave and oar;
Oh rest ye, brother mariners, we will not wander more."

So we thought until we again set foot on *terra firma;* but there is a fascination in the dredge, and by the time the outward man was washed, and the inward man replenished, we thought that we'd be at it again the next fine day.

The six days spent off the Northumberland coast were attended with better results. The weather was, on the whole, favourable, and many interesting captures were made. The experience of the previous year induced us to re-engage the steam tug "Heatherbell," which we had found to be a good, sea-worthy craft, well adapted for our purposes. And, more important still, we knew her crew to be a steady and obliging set of men, who

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had gained from previous experience a readiness and interest in their work. So, on board the "Heatherbell," we started from Sunderland about six A.M. on the 21st of July. Our work was commenced off Marsden, where we put down the dredges in about 40 fathoms, at a distance of five or six miles from shore. We met with pretty good sport here, bringing up several interesting crustacea and zoophytes. Amongst the former were two specimens of *Hippolyte securifrons*, a fine species first described by Mr. Norman from specimens taken on this coast and in Shetland. Perhaps it would have been well had we tarried longer on this bit of ground, but we indulged in the belief that we should spend a day or two here later in the season, and so thinking, the dredges were hauled up after an hour or two's work; and we steamed ahead for Holy Island, where we arrived during the afternoon. It is needless to enter into details respecting what was done during each day of our stay here. Suffice it to say, that we scraped the sea bottom in every direction, and in various depths, up to 46 fathoms—the deepest water attainable on our coast during a single day's cruise.

The results of the dredging will be described in detail by the gentlemen who have undertaken the work of reporting on the different classes. In this general preface it will be sufficient to note a few of the more interesting captures. First and foremost is *Echinocardium pennatifidum* (Norman, M. S.), a fine sea-urchin, hitherto confounded with *Echinocardium gibbosum* (Agassiz), and previously known as British only from a single specimen taken several years ago in Shetland. Another very interesting Echinoderm, of which a few fine specimens were taken, is *Psolus squamatus*, one of the soft-bodied forms (sea-cucumbers), one example of which had been previously obtained on our coast by Mr. Alder. I believe, however, that his specimen was by no means so fine as those dredged last year. A small *Echinus*, exhibited by Mr. Norman at the Manchester meeting of the British Association, and called by him *E. neglectus, var. B.*, was taken abundantly. This, however, has claims to be regarded as a distinct species, and will be described by Mr. Norman from his Shetland specimens under the name of *Echinus pictus*. Off Dunstanborough

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were taken three specimens of the Featherstar, *Antedon rosaceus*, a very rarely noticed inhabitant of our shores, and here also a remarkably fine haul of zoophytes was obtained; but the species were all, with one or two exceptions, such as were previously known to inhabit our district. There was also in this locality an astonishing abundance of one of the less common Brittle-stars, *Ophiocoma nigra*. The Mollusca were very poor, the only species new to the district being *Chiton albus, L.*, of which a single specimen was dredged off Holy Island. Some of the sand-covered Ascidians taken on the Durham coast require further examination. We may hope that they will afford something of interest for Messrs. Alder and Hancock's promised work on the Tunicata. Two fine examples of *Stylifer Turtoni* were found adherent to an *Echinus pictus* off Holy Island. And with reference to this Echinus it may be remarked, that though the dredges were put down, as we thought, on the very spot where we obtained, the previous year, abundance of *Echinus Dröbachiensis*, nevertheless this time not one specimen of the latter species came up. There must have been plenty of it within a few yards of the dredge; for the nature of the locality, almost close beneath the cliffs of one of the Fern Islands, precluded the possibility of any great error in this respect.

Amongst stalk-eyed Crustacea the following deserve notice: *Atelecyclus heterodon*, *Pagurus cuanensis*, *Hyndmanni* and *ferrugineus*, *Crangon Allmanni*, *spinosus*, *nanus* and *fasciatus*. *Pagurus ferrugineus* and *Crangon fasciatus* are new to the district. The most important Amphipoda are the following: *Lysianassa Costæ*, *Anonyx Holböllii*, *Haploops tubicola*, *Monoculodes carinatus*, *Westwoodilla cæcula*, *Protomedeia Whitei*, *Œdiceros parvimanus*, *Urothoe marinus*, *Dexamine Vedlomensis*, *Calliope bidentata (undescribed)*, *Eusirus Helvetiæ*, *Heiscladus longicaudatus*, *Cheirocratus mantis* and *Unciola planipes*, the two last-named being new species now described by the Rev. A. M. Norman. Of Ostracoda, besides *Cythere contorta* and *C. avena*, the following new species, also described by Mr. Norman, were taken: *C. lævata*, *declivis*, *limicola*, *latissima*, *guttata*, *multifora*, and *Cythereis Dunelmensis*. A new and very interesting Copepod, *Calanus Clausii* (Brady) was taken in

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great numbers, and a new Pycnogon, *Nymphon rubrum* (Hodge) was captured on the Durham coast. Descriptions of these, as well as of the other new species, will be found in the reports of the sections to which they belong.

Amongst Polyzoa Mr. Alder reports the following as being new to the coast: *Lepralia annulata* and *Tubulipora lobulata*. *Bugula Murrayana* was abundant, and appears to be pretty nearly confined to the east coast. Among Hydrozoa the most interesting captures were *Tubiclava Cornucopiæ* (a new form lately described by Mr. Norman from specimens taken in Shetland), *Plumularia myriophyllum*, a rare species new to this coast, and *Halecium labrosum*.

Several fine sponges were obtained off Dunstanbro', but these have not yet been completely examined.

The lists of species in the various departments have been tabulated, as far as possible, so as to present at a glance the results obtained in each year. The captures of each year have been also divided into two columns, in order to show separately the species taken on the Durham and Northumberland coasts. In 1862, however, no dredging was done on the Durham coast: the second column is therefore occupied by the Dogger Bank, which was not visited in the subsequent years. The occurrence of a species is noted with an asterisk.

A synopsis of the various new and undescribed species will be found at the end of the report.

G. S. B.

Report on the Mollusca, by Joshua Alder.

In reviewing the results of the three years' dredgings, now brought to a close, we find that, so far as the Mollusca are concerned, not much has been added to our previous knowledge, though additional information concerning their distribution, and the comparative abundance or rarity of the different species has been obtained. One beautiful nudibranch, the *Hero formosa* of Lovén, has been added to the British Fauna, and four testaceous gasteropods, *Eulima nitida*, *E. gracilis*, *Rissoa cimicoides*, and

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Chiton albus, have been got for the first time on the north-east coast; but a few fine and rare species, including *Fusus Turtoni*, *F. Norvegicus*, *F. Berniciensis*, and *Buccinopsis Dalei*, for which this locality has obtained some celebrity, were not met with during the dredgings, a single ovicapsule of *F. Turtoni* being the only indication of the presence of any of them. Repeated attempts to procure these fine shells by dredging have failed, both here and on the Yorkshire coast. The probability is that they inhabit rocky ground on which the dredge will not work. This is the more likely, as the allied species, *Fusus antiquus*, which is known to be common on this coast, and is brought in constantly on the fishermen's lines, was met with very sparingly, and in an immature state.

The only Cephalopods obtained belong to the genus *Sepiola*, of which both the British species are now shewn to inhabit our coast, a single individual of *S. Rondeletii* having been met with in the last dredgings near Holy Island: the specimen is peculiar in having the fins angulated at the top; but this is perhaps only an accidental variation from the usual form.

Of the Tunicata it may be remarked, that two of the species here catalogued, *Cynthia comata* and *C. vestita*, have not yet been found in any other locality. I had supposed the latter to be identical with the *Cynthia* (*Glandula*) *glacialis* of M. Sars, but from a more detailed description of that species, which the learned Professor has since published, the two forms prove to be distinct. I have therefore fallen back upon the name that I had at first proposed for the British species. *Ascidia conchilega* of Müller, referred by Forbes to the restricted genus *Ascidia*, I have since ascertained to be a *Molgula*. It has not been found before on the eastern coast.

The dredging excursions being mostly confined to the coralline and deep-water zones, few of the common littoral species were met with, and these principally dead shells. The only exceptions to this were *Mytilus edulis*, *Trochus cinerarius*, and *Aemœa virginea*, the former of which was found alive in 15 fathoms, and the two latter in 40 fathoms, near the Fern Islands.

The first year's dredging was the most productive in Mollusca: 137 species (including *Tunicata*) were then obtained. From these

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may be deducted five species, *Murex erinaceus*, *Margarita cinerea*, *Astarte elliptica*, *Mya Uddevallensis*, and *Saxicava sulcata*, presumed to be fossil. This will leave 132 species; to which have been added in the subsequent dredgings 32 species, making the whole number 164, distributed as follows:—

Cephalopoda	2
Gasteropoda	84
Lamellibranchiata	65
Tunicata	13
	164

Any comparison instituted between the species obtained in these dredging expeditions and the Faunas of other marine localities will be in some respects imperfect, inasmuch as they represent only a part of our Fauna, the littoral and Laminarian species being scarcely at all represented. Several important deep-water species are also absent. On the whole, however, they bear out the boreal character of the marine Invertebrata of our coast. Taking the testaceous Mollusca alone for comparison, as the naked Mollusks and Tunicates have scarcely been sufficiently examined in northern latitudes, and are entirely absent in fossil beds, the following results have been obtained. The Testacea met with amount to 135. Of these about 30 are now living in the Arctic seas, and no less than 120 are found on the shores of Norway and Sweden, leaving only 15, mostly very small and inconspicuous kinds, that have not yet been detected in those boreal regions. A somewhat larger number, about 20, and these more conspicuous species, less likely to be overlooked, are absent on the south coast of England. Upwards of 50 of our species are met with in the glacial and post-pleiocene beds of this country, and a large number, 82, are found fossil in the Crag.

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MOLLUSCA.

CEPHALOPODA.

	1862.		1863.		1864.		Remarks.
	Northumberland.	Dogger Bank.	Northumberland.	Durham.	Northumberland.	Durham.	
Sepiola Atlantica, *D'Orb.* ..	*	..	*	..	..	..	
Rondeletii, *Leach*....	..	..	..	..	*	..	One specimen with the fins angulated at the top.

GASTEROPODA.

Trophon clathratus, *Linn.* ..	*	*	*	..	*	..	Fine on the Dogger.
Barvicensis, *Johns.*	*	*		..	..	..	Ditto.
Fusus gracilis, *Da Costa*....	*	*	*	..	*	*	
propinquus, *Alder* ..	*	*	*	..	*	*	
antiquus, *Linn.*.....	*	*	*	..	*	*	Small & young.
Turtoni, *Bean*	..	*	..		..	..	A capsule only.
Buccinum undatum, *Linn.* ..	*	*	*	*	*	..	
Nassa incrassata, *Müll.*	*	*	*	..	*	*	Rare and mostly dead.
Mangelia costata, *Penn.*	*	..	..	..	*	..	
brachystoma, *Phil.*	..	*	..	..	..	..	One specimen.
linearis, *Mont.* ..	*	*	*	..	*	..	
teres, *Forbes*	*	..	*	..	*	..	
Trevelyana, *Turt.*	*	*	*	*	*	..	
turricula, *Mont.*..	*	*	*	..	*	..	
Cypræa Europea, *Mont.*	*	..	*	..	*	..	Dead.
Natica Alderi, *Forbes*, (nitida *F. & H.*..... ..	*	*	*	*	*	*	Common, but small.
Montagui, *Forbes*....	*	*	*	..	*	..	
helicoides, *Johns*.....	..	..	..	..	*	..	Two young dead shells.
Grœnlandica, *Beck*...	..	*	..	..	..	..	
Velutina lævigata, *Linn.*....	*	*	*	*	*	..	
Trichotropis borealis, *Brod.*.	*	*	*	..	*	..	
Odostomia insculpta, *Mont.*.	*	..	..	..	..	..	
interstincta, *Mont.*	*	..	..	..	..	..	
spiralis, *Mont.* ..	*	..	..	..	..	..	
turrita, *Jeff.*	*	..	..	..	*	..	
unidentata, *Mont.*	*	..	..	..	..	..	
Eulimella Scillæ, *Sacchi.* ..	*	..	..	..	..	..	
acicula, *Phil.*	*	*	..	..	..	..	
Chemnitzia fulvocincta, *Thom*	*	*	..	..	*	..	
indistincta, *Mont.*	*	..	..	..	..	..	
Eulima distorta, *Desh.*.....	*	..	..	..	..	..	
bilineata, *Alder*	*	*	..	..	*	..	
gracilis, *F. & H.* ..	*	..	..	..	..	..	
nitida, *Lam.*	*	..	..	..	..	..	
Stylifer Turtoni, *Brod.*	..	..	*	..	*	..	Three living specimens on *Echinus pictus*.

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	1862.		1863.		1864.		Remarks.
	Northumberland.	Dogger Bank.	Northumberland.	Durham.	Northumberland.	Durham.	
Aporrhais pes-pelecani, *Linn.*	*	.	*	*	*	*	
Turritella communis, *Risso*	*	*	*	*	*	*	Common.
Scalaria Trevelyana, *Leach*	*	*	*	*	*	.	
Rissoa inconspicua, *Alder*	..	*	..	..	..	..	Rare.
punctata, *Mont.*	*	..	..	..	*	..	
cimicoides, *Forbes*	*	..	..	..	..	..	Dead.
striata, *Mont.*	*	..	..	..	*	..	Ditto.
parva, *Da Costa*	..	..	..	..	*	..	In shallow water.
ulvæ, *Penn.*	*	..	..	..	..	..	
Lacuna vincta, *Mont.*	..	..	.	..	*	..	Dead.
Cœcum glabrum, *Mont.*	..	..	..	..	..	*	One specimen.
Trochus cinerarius, *Linn.*	..	..	*	..	*	*	Living in 40 fathoms.
millegranus, *Phil.*	*	..	*	..	*	..	Rather common
Montagui, *Gray*	*	..	*	..	*	..	Rare. Two alive
tumidus, *Mont.*	*	..	*	..	*	*	Common.
Zizyphinus, *Linn.*	*	..	*	*	*	*	
Emarginula reticulata, *Sow.*	*	..	*	..	*	..	
Puncturella Noachina, *Linn.*	*	*	*	..	*	..	
Pileopsis Hungaricus, *Linn.*	*	..	*	..	*	..	Small, & dead.
Acmæa virginea, *Müll.*	..	..	*	..	*	..	Rare. One livg. in 40 fathoms.
Dentalium entale, *Linn.*	*	*	*	*	*	*	Common.
Chiton fascicularis, *Linn.*	..	..	..	..	*	..	
ruber, *Linn.*	..	..	..	..	*	..	
albus	..	..	..	..	*	..	One specimen (living).
acellus, *Chemn.*	*	*	*	..	*	..	
marmoreus, *Fab.*	..	..	*	..	*	..	
lævis, *Penn.*	..	..	*	..	..	..	
Tornatella fasciata, *Lam.*	*	*	..	..	*	..	
Bulla Cranchii, *Leach*	*	..	.	..	*	..	Rare.
Cylichna cylindracea, *Penn.*	..	*	..	..	*	..	
strigella, *Lovén*	*	..	..	..	..	..	One specimen.
truncata, *Adams*	..	..	..	..	*	..	
umbilicata, *Mont.*	*	*	..	..	..	..	
Philine quadrata, *S. Wood*	..	*	..	..	..	..	Rare.
scabra, *Müll.*	*	*	..	..	*	..	
Doris tuberculata, *Cuv.*	..	..	..	..	*	..	
Johnstoni, *Ald. & Han.*	..	..	..	..	*	..	
pilosa, *Mull.*	..	..	..	..	*	..	Very large.
Idalia aspersa, *Ald. & Hanc.*	*	..	..	..	..	..	
Tritonia Hombergii, *Cuv.*	..	..	..	..	*	..	Small.
alba, *Ald. & Hanc.*	..	..	..	..	*	..	Rare.
plebeia, *Johns.*	*	..	..	..	*	..	
Dendronotus arborescens, *Mü.*	*	..	..	..	*	..	
Doto fragilis, *Forbes*	..	..	*	..	*	..	
Hero formosa, *Lovén*	..	..	*	..	..	..	One specimen.
Eolis coronata, *Forbes*	*	..	..	..	..	..	
Drummondi, *Thomp.*	*	..	..	..	..	..	

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	1862.		1863.		1864.		Remarks.
	Northumberland.	Dogger Bank.	Northumberland.	Durham.	Northumberland.	Durham.	
Eolis rufibranchialis, *Johns.*	..	*	..	..	.	..	
Antiopa cristata, *Delle Chiaje*	..	..	..	..	*	..	

LAMELLIBRANCHIATA.

Anomia ephippium, *Linn.* ..	*	..	*	..	*	*	
aculeata, *Müll.*	*	*	..	..	*	..	
Pecten opercularis, *Linn.* .	*	*	*	*	*	*	
pusio, *Penn.*.....	*	..	*	..	*	*	
similis, *Laskey*.....	*	..	..	..	*	..	
tigrinus, *Müll.*.....	*	..	*	*	*	..	
striatus, *Müll.*.....	*	..	..	..	..	..	One specimen.
subauriculata, *Mont.*	*	..	*	..	*	..	
Mytilus edulis, *Linn.*	*	..	..	..	..	..	Dead valves.
Lima Loscombii, *Sow.*.....	..	..	*	..	..	..	Small. Alive in 15 fathoms.
Modiola modiolus, *Linn.*....	..	*	*	..	*	..	
phaseolina, *Phil.* ..	*	..	..	..	..	..	
Modiolaria (Crenella) discors, *Linn.*.....	..	..	*	..	*	..	
nigra, *Gray*....	*	*	*	..	*	..	
marmorata, *Forb.*	..	*	*	*	..	..	
Crenella decussata, *Mont.*...	*	..	..	..	..	..	
Arca tetragona, *Poli*	*	..	..	..	*	..	One living in the cavity of a stone.
Nucula nucleus, *Linn.*.....	*	*	*	..	*	*	
nitida, *Sow.*.....	*	..	..	..	..	..	Rare.
tenuis, *Mont.*	*	*	..	..	*	..	
Leda candata, *Don.*.....	*	*	*	*	*	*	Common.
Cardium echinatum, *Linn.*..	*	..	*	*	..	*	
edule, *Linn.*.....	..	..	*	..	..	..	A valve.
fasciatum, *Mont.* ..	*	..	*	..	*	*	
punctatum, *Brocchi*	*	*	..	..	..	..	
Norvegicum, *Speng.*	..	..	..	..	*	..	
Lucina borealis, *Linn.*.....	*	..	*	..	*	..	
flexuosa, *Mont.*	*	*	*	..	*	..	
Kellia suborbicularis, *Mont.*	*	..	..	..	*	..	
Montacuta bidentata, *Mont.*..	*	..	..	..	*	..	
ferruginosa, *Mont.*	*	..	..	..	*	..	
substriata, *Mont.*	*	*		..	*	..	On *Spatangus purpureus.*
Cyprina Islandica, *Linn.*....	*	..	*	..	..	..	Young only.
Astarte compressa, *Mont.*....	*	*	*	*	*	*	Common.
sulcata, *Da Costa* ..	*	*	*	..	*	*	
var. Scotica.....	*	*	*	..	*	..	
triangularis, *Mont.*	*	..	..	.	..	..	
Venus casina, *Linn.*.....	*	..	*	..	..	..	Rare.
fasciata, *Don.*	*	..	*	*	*	*	
ovata, *Penn.*	*	*	*	*	*	*	

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	1862.		1863.		1864.		Remarks.
	Northumberland.	Dogger Bank.	Northumberland.	Durham.	Northumberland.	Durham.	
Venus striatula, *Don.*	*	..	*	*	*	*	The var. *Prideauxiana* is most common in deep water.
Artemis exoleta, *Linn.*	*	..	*	..	*	*	
lincta, *Pult.*	*	..	*	..	*	*	
Lucinopsis undata, *Penn.* ..	*	..	*	..	*	..	
Tapes virginea, *Linn.*	*	..	*	..	*	*	Fine specimens.
pullastra, *Wood*.....	..	..	*	..	..	..	
Mactra elliptica, *Brown*	*	*	*	*	*	*	
solida, *Linn.*	*	..	..	..	..	..	
subtruncata, *Da Costa*	*	..	..	..	*	..	
Tellina crassa, *Penn.*	..	..	*	..	*	..	
pygmæa, *Phil*.....	*	..	*	..	*	..	
Psammobia Ferroensis, *Chem.*	*	..	..	..	*	*	
tellinella, *Lam*...	*	..	*	..	*	..	
Syndesmya alba, *Wood*	*	..	..	..	..	..	
intermedia, *Thomp.*	*	..	..	..	..	..	Rare.
prismatica, *Mont*..	*	..	..	..	*	..	
Solen pellucidus, *Penn.*	*	..	..	*	..	*	
Mya arenaria, *Linn.*	*	..	..	..	..	..	Rare.
truncata, *Linn*.....	*	*	*	..	*	..	Mostly dead.
Corbula gibba, *Olivi.*	*	..	..	..	*	..	
Neæra brevirostris, *Brown*..	..	*	..	..	..	..	
Saxicava arctica, *Linn.*	..	..	..	..	*	*	
rugosa, *Linn.*	*	*	*	*	*	*	
Thracia phaseolina, *Lam.* ..	*	..	..	..	..	..	
villosiuscula, *Macg.*	*	..	*	*	*	*	
Lyonsia Norvegica, *Chemn*..	..	..	..	..	*	..	

TUNICATA.

Ascidia intestinalis, *Linn.* ..	*	*	..	..	*	..	
sordida, *Ald. & Hanc.*	*	..	*	*	*	*	
parallelogramma, *Mü.*	..	*	..	..	..	..	
Molgula arenosa, *Ald. & Han.*	*	*	*	*	..	..	
conchilega, *Müll.* ..	..	*	..	..	..	..	
Cynthia vestita (glacialis) *Ald.*	*	..	..	..	..	*	
comata, *Alder*.....	..	..	..	..	..	*	
coriacea, *Ald. & Han.*	..	*	..		..	..	
grossularia, *Van Ben.*	*	*	..	..	..	..	
Pelonaia corrugata, *F. & G.*.	..	..	..	*	..	..	
Clavelina lepadiformis, *Müll.*	*	..	..	..	..	..	
Polyclinum (sp.)	..	*	..	..	..	..	Specimens not preserved.
Botryllus (sp.)	..	*	..	..	..	*	

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Report on the Crustacea, by the Rev. Alfred Merle Norman, M.A.

The Crustacea taken during the Association dredging of the summer of 1864 number 157 species, including the Pycnogonoidea reported on by Mr. Hodge. Among them are two Amphipods and several Ostracoda which are new to science, and will be presently described. The following also deserve especial notice as either new to our local Fauna, or interesting on other accounts.

Pagurus ferrugineus, Norman. (Ann. Nat. Hist. Oct. 1861. Pl. XIII, figs. 1–3.) Two examples of this recently distinguished species were procured three miles off Dunstanborough, associated on the same ground with *Pagurus Bernhardus*, *P. pubescens*, *P. lævis*, and *P. Hyndmanni*. This species has now been dredged by me in the four most extreme parts of the British coast, namely, at Shetland, Guernsey, in the Firth of Clyde, and off the Northumberland coast. *Pagurus ferrugineus* would therefore seem to be distributed all around our shores, but has probably hitherto generally escaped attention on account of its small size, and the mistaken assumption that it was the young of some other species.

Crangon fasciatus, Risso. A single specimen of this shrimp, which had not been previously met with on any part of the eastern coast, was dredged in shallow water within the Fern Islands.

Some rare Amphipoda were for the first time taken in our district, namely, *Anonyx Holböllii, Kroyer; Monoculodes carinatus, Bate; Westwoodilla cæcula, Bate;* and *Protomedeia Whitei, Bate;* and two species were also found which belong to genera previously unknown in Great Britain, and one of which is new to science. It may be thus characterized—

FAM. GAMMARIDÆ, *Norman.* (Subfam. Gammarides B. & W.)

GENUS. CHEIROCRATUS,* n. gen.

Superior antennæ shorter than inferior, having a secondary appendage. First gnathopods not subchelate. Second gnathopods

* χείρ and κρατέω; strong in the hand. The new Amphipoda will also be described in the Brit. Assoc. Report for 1864.

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subchelate, very large. Telson double. Last pair of pereiopods very long.

Cheirocratus mantis, n. sp. Pl. VII, figs. 14, 15.

Eyes of moderate size, irregularly round, placed between the origins of the two pairs of antennæ. *Superior antennæ* about equal to the first four segments of the body in length; first joint much stouter than, but not quite so long as, the second; third joint half the length of the second; filament of about twenty articulations and of nearly the same length as the peduncle; secondary appendage two-jointed, and about equal in length to the first two articulations of the filament. *Inferior antennæ* imperfect in the type specimen, very large and strongly developed, the end of the penultimate joint of the peduncle reaching to half the length of the filament of the superior antennæ; the olfactory denticle is large, and there is a small spine at the inferior extremity of the third joint. *First gnathopods* not subchelate, having the propodos 3–4 times as long as broad, and the dactylus scarcely curved, broad, with numerous short spines fringing the posterior margin. *Second gnathopods* having a large basos which becomes gradually wider towards the lower extremity, fringed anteriorly with very long simple hairs, and furnished with a few very minute and short hairs on the hinder margin; carpus triangular, not produced above or below, but widening towards the extremity to receive the very large propodos; propodos equalling in length the first three segments of the body, about two and a half times as long as broad, widest at the commencement of the palm, which is very oblique, half the length of the propodos, and furnished with three large teeth; dactylus strong, much curved, inner margin simple, equal to rather more than half the palm in length (reaching beyond the second tooth). Last three pairs of *pereipods* having the basos twice as long as broad, anteriorly beset with strong, spine-like hairs, and posteriorly with very minute slender hairs, each of which is set in a little notch. Last *pereipods* very long, with the propodos greatly developed and much flattened. First *uropods* extending considerably beyond the second; those of the last pair imperfect in

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the type specimen. *Telson* double. *Pleon* having the inferior margins of the second and third segments furnished with hairs and produced posteriorly into a spine-like point; the dorsal margin of the fourth segment is produced into two or three spines, between which is a long cilium; and the dorsal margin of the fifth segment has two spines placed close together on either side of the central line. *Coxæ* shallow.

A single specimen dredged in deep water off Holy Island, July, 1864.

Fam. COROPHIIDÆ. *Bate and Westwood.*

Genus. UNCIOLA, *Say.*

Antennæ of both pairs with multiarticulate flagellæ; the superior pair furnished with a minute secondary appendage. First gnathopods subchelate; second not subchelate. Telson squamate, simple. Last uropods double-branched, tipped with hairs, inner branch minute, scarcely as long as the peduncle of two preceding pairs, which are two-branched, and have their truncate extremities armed with strong spines.

Unciola planipes, n. sp. Pl. VII, figs. 9–11.

Superior antennæ having the first joint of the peduncle not so long as the second, but slightly longer than the third; filament (about seventeen jointed) equal in length to the peduncle; secondary appendage very minute, consisting of a single joint, which is not longer than the first joint of the filament. *Inferior antennæ* having the peduncle equal in length to that of the superior, but the filament not more than half the length of that of the preceding organs; third joint of peduncle much shorter than fourth, which equals the fifth. *Head* furnished with a rostrum. First *gnathopods* subchelate, beset on both margins with tufts of simple hairs; propodos slightly longer than the carpus, subovate with a very oblique concave palm extending about half its length, and furnished with two tubercular processes; dactylus simple, gently curved. Second *gnathopods* not subchelate, having the carpus and propodos remarkably flattened, and fringed with thick sets of hairs; dactylus small, taking its origin from the

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inferior half of the truncated apex of the propodos, immersed in a dense tuft of hairs which spring from the upper portions of the apex, and from the sides of the propodos. *Pereiopods* having large falciform dactyli, which are furnished on their inner side with simple hairs. *Body* slender; basos of all the legs very small; posterior angles of first three abdominal segments produced backwards into conspicuous teeth. *Telson* squamiform. *Uropods* of first and second pair having their branches margined and terminated by large spines; uropods of last pair two-branched, small, scarcely reaching beyond telson, or the basal joint of preceding pair; outer branch tipped with long simple hairs; inner branch terminating in a single spine. Length a third of an inch.

A single specimen was dredged in July, 1864, off Holy Island; but the species was procured by me more abundantly in about seven fathoms water at Balta Sound, Shetland, in June, 1863. *Unciola planipes* is apparently nearly allied to *Unciola leucopes* of Kröyer, which is a native of South Greenland.

Order. OSTRACODA.

Fam. CYPRIDÆ.

Genus. CYTHERE, *Müller*.

Cythere debilis. *Jones*. Pl. V, figs. 5–8.

Cytheridea debilis, Jones, Tertiary Entomostraca (Palæon. Soc. Trans.) p. 43. Pl. VI, fig. 13.

Cythere Bradii, Norman, M.S. Brit. Assoc. Report for 1864.

Oblongo-ovate, of nearly equal height throughout; length to breadth as two and a half to one, very tumid. Ventral margin nearly straight, very slightly incurved a little before the middle, dorsal margin subparallel to ventral, having a nearly equal slope at the two extremities, the anterior of which is well and equally rounded, while the posterior, which is slightly the wider of the two, and a little more produced below, has the dorsal curve much longer than the ventral. Lucid spots, consisting of a transverse row of four placed close to each other, and two others at some

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distance in advance of these, and separated from each other. Dorsal view elongated ovate. End view nearly round. Hinge margin crenulated throughout its length. Carapace white, smooth, but studded with scattered opaque white punctures. Length half a line.

Dredged 100 miles off Tynemouth in 1862, and 10–15 miles off Seaham in 40-48 fathoms in 1864.

It would have been impossible to identify this species with the figure and description given by Mr. T. Rupert Jones in "The Entomostraca of the Tertiary Formation;" but Mr. G. S. Brady has kindly informed me that he has Norwegian and Arctic specimens which seem to be identical with those taken on this coast, and which have been pronounced by Mr. Jones to be his *Cytheridea debilis*.

Cythere declivis, n. sp. Pl. V, figs. 9–12.

Subtriangular, closely resembling a miniature *Mytilus edulis* in form; highest before the middle, length to breadth as about one and three quarters to one; subcompressed. Ventral margin slightly (rarely considerably) incurved in the centre; dorsal margin anteriorly well arched, but sloping rapidly from about the middle towards the posterior extremity. Anterior end wide and well rounded; posterior extremity narrow, rounded. Lucid spots consisting of four placed close together in a transverse curved line (of which the lowest is the largest, and each of those above smaller than its predecessor,) and in front of these a large comma-formed spot, apparently formed by the coalescence of two. Ventral view cuneiform, moderately convex behind, much compressed in front, juncture of the valves impressed. Carapace white, translucent, smooth, but marked with conspicuous opaque white scattered punctures;* anterior margin with radiating riblike markings. Length not quite one third of a line.

Taken off Holy Island and Seaham during the past season. I

* What I have called here and in the description of the last species "punctures" are not sunken impressions, but slightly *elevated tuberoular processes, which are perforated in the centre.* Such structures are not uncommon among the Ostracoda, and might perhaps be best described as "*perforated papillæ.*"

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have also specimens from Plymouth, Roundstone Bay, and Shetland; and others are in Mr. G. S. Brady's collection from Donegal and Preston Pans Thus the species would appear to be distributed all round our coasts.

Cythere avena, Norman.

Cythere mytiloides, Norman, Ann. Nat. Hist., January, 1862. Pl. III, figs. 1–3.

The specific name, *mytiloides*, having been previously employed in this genus by Bosquet, it becomes necessary to change the title of the form described by me in the *Annals of Natural History*. *Cythere avena*, as it is now proposed to style it, has been taken off both the Durham and Northumberland coasts. The type specimens were from the Firth of Clyde, and I have since obtained it from Arran in Ireland, Roundstone Bay, and Shetland.

Cythere simplex, n. sp. Pl. V, figs. 1–4.

Elongo-elliptic, cuneiformly produced posteriorly; greatest height behind the centre; length to breadth as two and a half to one; compressed. Ventral margin slightly incurved anteally, and very convex posteally; dorsal margin straight in the centre, and sloping nearly equally towards each extremity. Anterior extremity well rounded; posterior considerably produced to a central point to which the dorsal and ventral margins equally and gradually converge. The only lucid spots which I am able to detect are five elongated spots ranged side by side in the form of a fan slightly in advance of the middle of the carapace. Carapace very thin and delicate in structure, transparent, and perfectly smooth, presenting no appearance of punctures or sculpture of any kind. Hinge line perfectly simple; valves having a broad internal marginal lamella, most developed behind. Length three quarters of a line.

This is the species which was recorded by me in the report of the dredging of 1862 (Trans. T. N. F. C., Vol. V, p. 266), under the name of *Cythere acuta, Baird*. I have since, however, through the kindness of Dr. Baird, had an opportunity of examining the type specimens on which that species was established,

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and find them to be carapaces of the larva of a Balanus, and not of a Cythere. At the time when the *Natural History of the British Entomostraca* was written we were not so well acquainted with the development of the Cirripedia as at the present day, and hence arose my friend's mistake. *Cythere acuta* must therefore be struck out of our lists. *Cythere simplex* was dredged in 1862, about 100 miles off Tynemouth, and again in 1864 off Holy Island. Mr. G. S. Brady's collection contains specimens from Bute, Shetland, and the Arctic seas.

Cythere lævata, n. sp. Pl. V, figs. 13–16.

Oblongo-ovate, highest before the middle at the commencement of the supero-anteal slope; length to breadth as one and three quarters to one, moderately convex. Ventral margin slightly concave on the anterior half, and convex posteriorly; dorsal margin nearly straight, the anterior slope the longer. Anterior extremity well rounded, gradually arched into the superior margin above, more suddenly rounded below. Posterior extremity slightly produced centrally, the superior and inferior slopes nearly equal. Lucid spots, consisting of four oblong impressions in a transverse line, and a semicircular spot in front. Carapace white, smooth, polished, with a few small scattered punctures; valves bordered by a keel-like fillet, which is more conspicuous behind. Length, not one third of a line.

Dredged July, 1864, off Holy Island, and I have also seen it from the following localities:—Shetland and Roundstone Bay (A. M. N.); Margate, Southwold, Donegal, Race's Bank, and mouth of the Ribble (Mr. G. S. Brady).

Cythere multifora, n. sp. Pl. VI, figs. 13–16.

Cythere rugosa, Norman, M.S. Brit. Assoc. Report for 1864, (*but not C. rugosa of Speyer.*)

Oblongo-ovate, of nearly equal height throughout, length to breadth as two and a half to one, abruptly swollen immediately above the margin of the valves, and thence sloping to dorsal margin. Dorsal and ventral margins nearly straight, and subparallel; both extremities rounded. Dorsal view prismoidal; (parallel-sided, with conical extremities). Carapace excavated

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with large deep cells, which leave the interstices standing out in the form of an elegant network. Junction of the valves keeled. Length one fourth of a line.

Taken off Holy Island July, 1864; and obtained by me also during the previous year in the Shetland seas.

Cythere latissima, n. sp. Pl. VI, figs. 5–8.

Cythere obesa, Norman, M.S. Trans. Tyneside Nat. Field Club. Vol. V, p. 266, and Brit. Assoc. Report for 1861 (*but not C. obesa of Reuss*).

Peach-stone formed, or shortly ovate, with a short central posterior projecting process; greatest height subcentral; length to breadth as one and a half to one, excessively tumid and gibbous. The ventral margins of the valves are produced into a conspicuous keel, on either side of which the carapace is extremely broad, the valves being projected directly outwards in the form of a strong ridge which externally bends outwards and downwards so as to reach below the level of the margin of the valves. The tumidity of the carapace in this part is excessive, and from thence the valves slope rapidly to the dorsal margin. End view triangular. Carapace white, opaque, punctate. Length one third of a line.

This remarkable form was dredged in 1862 on the Dogger Bank, and during the past season off Holy Island, and off Seaham. I have also specimens from Shetland and Roundstone Bay, and Mr. G. S. Brady has found it among sand dredged at the mouth of the Ribble, and in shell-sand from Cowes, Isle of Wight.

Cythere guttata, n. sp. Pl. VI, figs. 9–12.

Cythere concentrica, Norman, M.S. Report Brit. Assoc. for 1864 (*but not of Reuss nor Williamson.*)

Ovate, or peach-stone shaped, slightly produced to a central point behind; greatest height and greatest tumidity before the centre; very tumid. Dorsal margin nearly straight in the centre, suddenly sloping posteally, and forming in conjunction with the infero-posteal similarly suddenly sloping margin a small truncated projection. Ventral margin slightly waved. Anterior extremity

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broadly rounded. Carapace excavated with large cells, which have a somewhat concentric arrangement. Length one third of a line.

Allied to *C. convexa*, but in that species the carapace is less tumid, the anterior extremity is broader, and the posterior process is not central but inferior; the excavations are not so large, though the species attains much greater dimensions than *C. guttata*. The close resemblance which *C. guttata* bears to a peach-stone in all respects is most striking.

Dredged in 1864 off Holy Island, and also 10–15 miles off Seaham, in about 40 fathoms.

The genus Cythere is so extensive, and the recent and fossil species, already described, are so numerous, that it has become a matter of no small difficulty to find appropriate names, which have not been already pre-occupied by British or foreign authors. It will be seen in the previous descriptions that I have been unfortunately compelled to re-name many of the species, having found that the names which I had at first proposed were already appropriated to some fossil forms by Bosquet, Reuss, and Speyer.

Genus. CYTHEREIS, *Jones*.

Cythereis limicola, n. sp. Pl. VI, figs. 1–4.

Oblong, short: greatest height at the commencement of the antero-dorsal slope; length to breadth as one and three quarters to one; sub-compressed. Ventral margin straight, dorsal having a long anterior slope from the highest point; and a gradual downward inclination from the same point posteriorwards. Anterior extremity wide, rounded; posterior extremity rather narrower and subtruncate. Carapace having a greatly elevated longitudinal rib a little within the ventral margin, from the anterior extremity of which about three smaller ribs or crenations proceed divergingly to the front of the valve; there are also two nodular humps placed side by side near the posterior termination of the hinge margin. Length, about one fourth of a line.

Discovered on the Dogger Bank, about 100 miles east of

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Tynemouth, in 1862; and again obtained last summer 10–15 miles off Seaham in about 40 fathoms.

Cythereis Jonesii, Baird. Pl. VII, figs. 5–8.

Cythereis Jonesii, Baird, Hist. Brit. Entom. p. 175, Pl. XX, fig. 1.

Cythereis fimbriata (Roemer), Norman, Ann. Nat. Hist., Jan. 1862, Pl. III, fig. 9.

Having had the opportunity, through the kindness of Dr. Baird, of examining the type specimens of his *Cythereis Jonesii*, I find that they are the same species as that described by myself in the *Annals* under the name of *Cythereis fimbriata* (Roemer). As some doubt may attach to the identification of the species with that of Roemer it will be better to make use of the name given to it in "The History of British Entomostraca."

Cythereis Jonesii has been taken by me 100 miles east of Tynemouth, in 1862; in Lamlash Bay; and at Shetland: and Dr. Baird's specimens are from the Isle of Skye. Neither Dr. Baird's figure nor my own do justice to the great beauty of form of this species when in a perfect state, since in each case they were drawn from single and imperfect valves. The species is now therefore refigured from a fine specimen taken on the Dogger Bank, and it seems also desirable thus to redefine it.

Oblong, or oblongo-elliptic; greatest height at the anterior extremity of the hinge; length to breadth as about two to one; compressed above, very tumid below. Ventral margin slightly arched, extended at both extremities beyond the dorsal margin; dorsal margin somewhat concave; extremities obliquely truncate, the anterior the wider. Carapace smooth in the central area, but ornamented with a fringe of greatly developed linguiform, erect or nearly erect processes commencing at the middle of the anterior extremity, and passing round the ventral side of the valve at a short distance from the margin, and thence ultimately bending upwards, and terminating in some greatly elevated processes situated on the central portion of the valves at a little distance from the hinder extremity. Similar linguiform processes, (four or five in number,) again reappear at the infero-postcal angle, and

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also on the dorsal margin. Hinge line furnished in front with a large tubercular hump, whence a well-defined rib passes down the supero-anteal slope, and is continuous with the commencement of the fringe of linguiform processes. Carapace seen from below irregularly lozenge-shaped, having elevated longitudinal riblets on each side of the junction of the valves, and the linguiform processes stretched out laterally as elegant wings, which are widest behind the middle. End view in the form of an equilateral triangle, the basal line of which is remarkably straight. Length rather more than half a line.

Cythereis Dunelmensis, n. sp. Pl. VII, figs. 1–4.

Oblong. Dorsal and ventral margins straight but not parallel, gradually inclining towards each other from the broad well rounded anterior extremity to the rectangularly truncate posterior end. Surface of valves excavated with cells, the interstices between which stand out as a network. Carapace margined in front by a row of beadlike spines; posteal extremity of ventral margin bearing four large, semi-erect, flattened, linguiform processes; other parts of the surface are also armed with small spines, conspicuous among which is a tubercular spine at the anterior extremity of the hinge line. Length half a line.

The type specimen—for as yet I have only seen a single example—was dredged 10–15 miles off Seaham in about 40 fathoms.

[A description of the following species, though not procured during the dredging expeditions, is added here, as it will complete the list of new Cytheres, which have been met with on the north eastern coast of England.

Cythere cellulosa, n. sp. Pl. V, figs. 17–20; and Pl. VI, fig. 17.

Nearly semicircular, but having one end of the semicircle replaced by an angle; highest in the middle; length to breadth as scarcely two to one; compressed. Ventral margin straight; dorsal margin strongly arched, the arch being continued anteriorly until it meets the straight ventral margin, which scarcely rises at all towards it; posterior extremity with a produced central angle, the upper and lower sides of which are unusually straight and equally divergent. Carapace having the valves

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excavated with very large cellular areolæ. Length about one sixth of a line.

Cythere cellulosa is the smallest species of this genus with which I am acquainted, and is a very remarkable and interesting form, the chief peculiarity of which consists in the very large cells which are excavated in the valves. I have procured it in sand from Berwick-on-Tweed, Lamlash Bay, and Guernsey; and Mr. G. S. Brady has specimens from Donegal Bay.]

In concluding the descriptions of the preceding new Crustacea, I must express my sincere thanks to Mr. G. S. Brady for the time and care which, amidst many pressing engagements, he has so kindly bestowed in drawing for me the admirable figures which illustrate the species.

The following table is intended to show the total number of Crustacea taken during the course of the three seasons' dredging on the Durham and Northumberland coasts.

	1862.		1863.		1864.		Remarks.
	Northumberland.	Dogger Bank.	Northumberland.	Durham.	Northumberland.	Durham.	
Stenorhynchus rostratus, *Lin.*	*	..	*	..	*	..	
longirostris, *Fabr.*	..	..	..	..	*	..	
Inachus Dorsettensis, *Penn.*	*	..	*	..	*	*	
dorhynchus, *Leach.*	*	..	*	..	*	..	
Hyas coarctatus, *Leach.*	*	*	*	..	*	*	
Eurynome aspera, *Penn.*	..	..	..	..	*	..	
Cancer pagurus, *Linn.*	..	..	*	..	*	..	Tide marks.
Carcinus mœnas, *Linn.*	..	..	..	..	*	..	Tide marks.
Portunus holsatus, *Fabr.* ...	*	..	*	..	*	*	
pusillus, *Leach.* ..	*	*	*	..	*	*	
Ebalia Cranchii, *Leach.*	*	*	..	..	*	*	
tuberosa, *Penn.*	*	..	*	..	*	*	
Atelecyclus septemdentatus, *Mont.*	*	..	..	..	*	..	
Pagurus Bernhardus, *Linn.*	*	*	*	*	*	*	
pubescens, *Kröyer.*	*	*	*	*	*	*	
cuanensis, *Thomp.*	..	..	*	..	*	..	Rare.
lævis, *Thomp.*	*	*	*	*	*	*	
Hyndmanni, *Thom.*	*	..	*	..	*	..	
ferrugineus, *Nor.*	..	..	..	..	*	..	Very rare.
Porcellana platycheles, *Penn.*	..	..	..	..	*	..	Tide marks.
longicornis, *Penn.*	*	..	*	..	*	..	
Galathea squamifera, *Leach*	..	..	*	..	..	..	
intermedia, *Kröyer.*	*	..	*	..	*	..	
Andrewsii, *Kin.* ..	*		*	..	*	..	

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	1862.		1863.		1864.		Remarks.
	Northumberland.	Dogger Bank.	Northumberland.	Durham.	Northumberland.	Durham.	
Crangon vulgaris, *Fabr.*	..	..	*	..	*	..	
fasciatus, *Risso*	..	..	..	..	*	..	One specimen.
Allmanni, *Kinahan*	*	*	*	..	*	..	
nanus, *Kröyer*	..	*	*	..	..	*	
spinosus, *Leach*	*	..	*	..	*	..	
trispinosus, *Hailst.*	..	..	*	..	..	..	Very rare.
Pandalus annulicornis, *Leach*	*	*	*	..	*	*	
brevirostris, *Rath.*	*	..	*	..	*	*	
Hippolyte varians, *Leach*	..	..	*	..	*	*	
pusiola, *Kröyer*	*	..	*	..	..	..	
securifrons, *Nor.*	*	*	*	..	*	*	
Diastylis Rathkii, *Kröyer*	*	..	*	..	*	*	
Vaunthompsonia cristata, *Bte.*	..	*	..	..	..	..	Rare.
rosea, *Norman*	..	*	..	..	..	..	One specimen.
Eudora truncatula, *Bate*	..	*	..	..	..	..	Rare.
Cyrianassa ciliata, *Norman*	..	*	..	..	..	..	Very rare.
elegans, *Norman*	..	*	..	..	..	..	One specimen.
Mysis flexuosus, *Fabr.*	..	..	..	..	*	..	
spiritus, *Norman*	*	*	..	..	..	..	
Didelphys, *Norman*	*	..	..	..	..	..	One specimen.
Montagua monoculoides, *Mon.*	..	..	*	..	..	..	
Alderii, *Bate*	*	..	..	..	..	..	
pollexiana, *Bate*	*	..	..	..	*	..	
Lysianassa Costæ, *Edwards*	..	..	..	..	*	..	Rare.
longicornis, *Lucas*	..	..	*	..	..	..	Very rare.
Anonyx Holböllii, *Kroyer*	..	..	..	..	*	..	Very rare.
denticulatus, *Bate*	*	..	*	..	*	..	
longipes, *Bate*	..	*	*	..	..	..	Rare.
Edwardsii, *Kröyer*	*	*	..	..	..	..	
ampulla, *Kröyer*	..	*	..	..	..	..	Very rare.
Callisoma crenata, *Bate*	*	..	..	..	*	..	
Ampelisca Gaimardi, *Kröyer*	*	*	*	..	*	*	
Belliana, *Bate*	*	*	..	..	*	..	
Haploops tubicola, *Lilljeb.*	*	..	*	..	*	*	
Phoxus plumosus, *Kröyer*	*	*	..	..	..	..	
Monoculodes carinatus, *Bate.*	..	..	..	..	*	..	One specimen.
Kroyera altamarina, *Bate & W.*	..	*	..	..	..	..	One specimen.
Œdiceros parvimanus, *Bate & Westw.*	..	*	..	..	*	..	
Westwoodilla cæcula, *Bate*	..	..	..	..	*	..	One specimen.
Urothoe marinus, *Bate*	..		..	..	*	..	
Iphimedia obesa, *Rathke*	*	*	..	..	..	..	
Otus carinatus, *Bate*	..	..	*	..	..	..	Very rare.
Acanthonotus Owenii, *Bate*	*	*	*	..	*	..	
Dexamine Vedlomensis, *Bate & Westw.*	*	..	*	..	*	..	
Atylus bispinosus, *Bate*	*	..	..	..	..	..	
Calliope bidentata, nov. sp.	*	*	..	..	*	..	
Eusirus Helvetiæ, *Bate*	..	*	*	..	*	..	Rare.
Microdeutopus anomalus, *Rathke*	*	..	..	..	*	..	

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	1862.		1863.		1864.		Remarks.
	Northumberland.	Dogger Bank.	Northumberland.	Durham.	Northumberland.	Durham.	
Protomedeia Whitei, *Bate*	..	..	..	..	*	..	One specimen.
Melita proxima, *Bate*	..	*	..	..	..	..	
Cheirocratus Mantis, *Norman*	..	..	..	..	*	..	One only.
Eurystheus erythrophthalmus, *Lilljeb.*	*	..	..	..	*	*	
Amathilla Sabini, *Leach*	..	..	*	..	..	..	
Gammarus marinus, *Leach*	..	..	..	..	*	..	
Megamœra longimana, *Leach*	*	..	*	..	*	..	
Othonis, *Edwards*	*	..	*	..	*	..	
Alderi, *Bate*	..	*	..	..	..	..	
Heiscladus longicaudatus, *B. & Westw.*	*	..	..	..	*	*	
Heiscladus brevicaudatus, n. sp.	*	..	..	..	..	..	Very rare.
Amphithoe rubricata, *Mont.*	..	..	*	..	..	..	
Podocerus pelagicus, *Leach*	..	..	*	..	..	..	
capillatus, *Rathke.*	..	..	*	..	..	..	
variegatus, *Leach*	..	..	..	*		..	
Cerapus difformis, *Edwards*	*	*	*	..	*	..	
Dercothoe punctatus, *Edwards.*	..	.	*	..	*	..	
Nœnia excavata, *Bate*	..	..	..	..	*	..	
caudadentata, nov. sp.	*	..	..	..	..	..	One specimen.
Unciola planipes, *Norman*	..	..	..	..	*	..	
Corophium longicorne, *Fab.*	..	..	..	..	*	..	Shore.
Proto Goodsirii, *Bate*	*	..	..	..	..	..	
Protella phasma, *Mont.*	*	..	..	..	*	..	
Caprella linearis, *Latr.*	*	..	..	..	..	..	
lobata, *Müller*	*	..	..	..	*	..	
Arcturus longicornis, *Sow.*	*	*	..	..	*	*	
intermedius, *Goods.*	*	..	*	..	..	..	
gracilis, *Goodsir.*	*	..	..	..	*	..	
Phryxus longibranchialis, n.s.	*	..	..	..	..	..	One only.
Bopyrus	..	..	..	..	*	..	One specimen.
Idotea tricuspidata, *Desm.*	..	..	*	..	..	..	
Oniscoda maculosa, *Leach* (?)	*	..	..	..	*	..	
Eurydice pulchra, *Leach*	..	..	..	..	*	..	Rare.
Nebalia bipes, *Fabr.*	*	..	..	..	..	..	
Cythere reniformis, *Baird*	..	..	..	..	*	..	Tide marks.
guttata, *Norman*	..	..	..	..	*	*	
multifora, *Norman*	..	..	..	..	*	..	
pellucida, *Baird*	*	*	..	..	*	*	
quadridentata, *Baird*	*	*	..	..	*	*	
latissima, *Norman*	*	..	..	..	*	*	
nigrescens, *Baird*	..	..	..	..	*	..	
lævata, *Norman*	..	..	..	..	*	..	
variabilis, *Baird*	..	..	..	..	*	..	
avena, *Norman*	..	..	..	..	*	*	
contorta, *Norman*	..	*	..	..	*	*	
debilis, *Jones*	*	..	..	..	.	*	
aurantia, *Baird*	..	..	..	..	*	*	
simplex, *Norman*	..	*	..	.	..	..	Rare.

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	1862.		1863.		1864.		Remarks.
	Northumberland.	Dogger Bank.	Northumberland.	Durham.	Northumberland.	Durham.	
Cythere declivis, *Norman* ..	..	..	..	..	*	*	
Cythereis limicola, *Norman*	*	..	..	..	..	*	Rare.
Jonesii, *Baird* ..	..	*	..	..	..	..	Rare.
Dunelmensis, *Nor.*	..	..	..	..	..	*	One specimen.
Cypridina Brenda, *Baird* ..	..	*	..	..	..	..	
Tisbe furcata, *Baird*	..	..	..	..	*	..	Betw. tide mks.
Caligus curtus, *Müller*	*	*	*	..	*	..	
rapax, *Edwards*	..	*	*	..	*	..	
Anchorella uncinata, *Müller*	..	*	..	..	..	..	
Sacculina Carcini, *Thomp.* ..	..	..	*	..	.	.	
Peltogaster Paguri, *Rathke*..	..	..	..	*	..	..	Very rare.
sulcatus, *Lillj.* ..	..	..	..	*	..	..	Rare.
Clistosaccus Paguri, *Lillj.* ..	..	..	..	*	..	..	One specimen.
Balanus porcatus, *Da Costa*..	*	..	..	..	*	..	
crenatus, *Brug.*	..	*	..	..	..	..	
Hameri, *Ascanius*..	..	*	..	..	..	..	
Verruca Strömia, *Müller*....	*	.	..	..	*	..	
Scalpellum vulgare, *Leach* ..	*	..	..	..	*		
	66	43	51	7	88	31	
Total species taken	87		55		92		
Pelagic Entomostraca	9		11		0		
Pycnogonoidea.....	9		2		7		
	105		68		99		

It may be interesting to throw into tabular form the numbers of the different sections of the Crustacea procured during the several years. It must be understood, that the sections here employed are not scientifically equivalent to each other, though sufficiently so for our present purpose.

	1862.	1863.	1864.	Total in the three yrs.
Brachyura	9	8	13	13
Anomoura	7	9	10	11
Macroura.....	7	10	9	11
Mysidea	8	1	2	9
Isopoda	5	2	5	8
Amphipoda	33	19	31	53
Phyllopoda	1	0	0	1
Cladocera	2	2	0	2
Ostracoda	9	0	10	19
Copepoda	10	11*	3	12*
Pycnogonoidea	9	2	7	10
Cirripedia	5	4	3	9
	105	68	99	158

* This number includes *Alteutha bopyroides* (Claus), and *Thalestris longimana* (Claus), which were not actually taken during the expedition of 1863, but about the time of it.

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The localities which have proved richest in Crustacea are the Dogger Bank, which was peculiarly productive in the Diastylidæ, and the deep water off Holy Island. From the latter locality not a few Amphipods have been obtained which have not occurred elsewhere in our district.

In the year 1862 the deep sea on our coast had been but little dredged for Crustacea, and no less than 49 species were added to the local Fauna during the expedition of that year. They may be thus distributed: –

A. New to Science, 14.

Mysis Didelphys, Norman; *Vaunthompsonia rosea*, Norman; *Cyrianassa ciliata*, Norman; *C. elegans*, Norman; *Calliope bidentata*, sp. indes; *Heiscladus brevicaudatus*, sp. indes; *Nœnia caudadentata*, sp. indes; *Phryxus longibranchialis*, sp. indes; *Cythere simplex*, Norman; *C. limicola*, Norman; *C. latissima*, Norman; *Calanus Clausii*, G. S. Brady; *Nymphon brevitarse*, Hodge.

B. Species new to Britain, 6.

Haploops tubicola, Lilljeborg; *Cythere debilis*, Jones; *Pleopis polyphemoides*, Lilljeborg; *Ichthyophorba hamata*, Lilljeborg; *I. denticornis*, Claus; *Dias longiremis*, Lilljeborg.

C. Species new to the Local Fauna, 29.

Inachus Dorsettensis, Pennant; *Crangon Allmanni*, Kinahan; *C. spinosus*, Leach; *C. nanus*, Kröyer; *Hippolyte securifrons*, Norman; *Vaunthompsonia cristata*, Bate; *Eudora truncatula*, Bate; *Anonyx Edwardsii*, Kröyer; *A. ampulla*, Kröyer; *A. longipes*, Bate; *Phoxus plumosus*, Holböll; *Kroyera altamarina*, B. & W.; *Acanthonotus Owenii*, Bate; *Dexamine Vedlomensis*, B. & W.; *Eusirus Helvetiæ*, Bate; *Microdeutopus anomalus*, Rathke; *Melita proxima*, Bate; *Eurystheus erythrophthalmus*, Lilljeborg; *Megamœra longimana*, Leach; *M. Othonis*, Edwards; *Heiscladus longicaudatus*, B. & W.; *Siphonoecetes*, ————; *Proto Goodsirii*, Bate; *Arcturus intermedius*, Goodsir; *A. gracilis*, Goodsir; *Nebalia bipes*, O. Fabricius; *Cythere quadridentata*, Baird; *Cytheréis Jonesii*, Baird; *Anomalocera Patersonii*, Templeton.

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In 1863, eight of the species procured may be thus distributed:

A. Species new to science, 0.

B. Species new to Britain, 4.
Thalestris longimana, Claus; *Alteutha bopyroides*, Claus; *Peltogaster sulcatus*, Lilljeborg; and *Clistosaccus Paguri*, Lilljeborg.

C. Species new to the Local Fauna, 4.
Lysianassa longicornis, Lucas; *Otus carinatus*, Bate; *Sacculina Carcini*, Thompson; *Peltogaster Paguri*, Rathke.

In 1864, of 16 species for the first time obtained on the coasts of Durham and Northumberland there were—

A. Species new to science, 8.
Cheirocratus Mantis, Norman; *Unciola planipes*, Norman; *Cythere declivis*, Norman; *C. lævata*, Norman; *C. multifora*, Norman; *C. guttata*, Norman; *Cythereis Dunelmensis*, Norman; *Nymphon rubrum*, Hodge.

B. Species new to Britain, 0.

C. Species new to the Local Fauna, 8.
Pagurus ferrugineus, Norman; *Crangon fasciatus*, Risso; *Anonyx Holböllii*, Kröyer; *Monoculodes carinatus*, Bate; *Westwoodilla cæcula*, Bate; *Protomedeia Whitei*, Bate; *Bopyrus*, ———; *Cythere avena*, Norman.

It will be seen from the foregoing statistics, that the whole results of the British Association dredging, as regards the Crustacea, are, that of a sum total of 158 species procured, 22 were new to science, 10 were species which had been described by Scandinavian and other naturalists but had not before been found in the British seas, and 41 others had not previously been obtained on this part of the coast. The additions therefore which have been made in this branch of marine zoology to our local Fauna are very satisfactory.

*** Since the foregoing has been in print, I have had an opportunity of examining the type specimens of *Cytheridea debilis*, Jones, and I am at a loss to understand how Professor Rupert Jones can have identified Mr. Brady's Arctic specimens with that species,

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to which they appear to me to bear no resemblance; and in the opinion which I here express Mr. G. S. Brady now entirely coincides. I propose therefore to restore to the recent form, which has been found on this coast, and in the Norwegian and Arctic seas, the name *C. Bradii*, which I had previously proposed for it. Judging from the figures and description in the *Monograph of the Tertiary Entomostraca of England*, *C. Bradii* (Norman), would seem to approach very closely to *C. pinguis*, Jones, and is chiefly distinguishable from that species by the absence of angulation of the dorsal margin. It was *C. pinguis* which I had in my thoughts when I inserted *C. Bradii*—without a name—in the dredging report of 1862, as a Cythere "new to science, if it be not identical with a Tertiary Fossil species."

Report on the Pelagic Entomostraca, by George S. Brady.

During the dredging expeditions of 1863 and 1864 the sea was mostly too rough to allow of the towing-net being used successfully. In 1862, owing to the generally smoother sea, it was worked to more advantage; but as the dredges occupied almost the entire attention of the party, the captures which we have to record must be looked upon as embracing only the commoner species of our free-swimming Oceanic Entomostraca. The gatherings of 1862 were made at a distance of fifty to one hundred miles from shore nearly due east of Tynemouth. Those of the following year were taken in the Holy Island district, and on the Durham coast, three or four miles off Ryhope. The total number of species taken was eleven, five of which are new to the British Fauna, and two others have been hitherto only very imperfectly recognized and described. Two out of the eleven belong to the order *Cladocera*, the remaining nine to the *Copepoda*. The two Cladocera belong to the family *Polyphemidæ*, the nine Copepods are distributed amongst the families *Harpactidæ* (one), *Peltididæ* (one), *Calanidæ* (six), *Pontellidæ* (one).

I have described and figured in this report all the new or imperfectly known species excepting *Thalestris longimana* and

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Alteutha bopyroides. Both of these belong to families which occur chiefly between tide-marks, and of which there remain several British species yet requiring notice. I therefore here content myself with the simple record of their capture in the open sea, leaving the more elaborate description of them until their congeners also can have due attention. One structural character in the Calanidæ and allied families seems scarcely to have attracted the attention it deserves as a specific mark, namely, the form of the terminal spine of the outer branch of the swimming feet; and more especially, the arrangement of the supplementary spines at its base. These will be found, in some cases at least, to afford diagnostic marks quite sufficient for the determination of a species, and I have therefore figured side by side, in plate I, the spines from the feet of all the British species. The figures are, in each case, taken from the fourth swimming foot.

	1862.	1863.	1868.
	50-100 miles east of Tynemouth.	Northumberland coast, (Holy Island.)	Durham coast, (off Ryhope.)
CLADOCERA.			
Evadne Nordmanni, *Lovén*	common	.....	common.
Pleopis polyphemoides, *Leuckart*	scarce	.....	common.
COPEPODA.			
Thalestris longimana, *Claus*	.....	.....	rare.
Alteutha bopyroides, *Claus*	.....	.. ..	rare.
Cetochilus septentrionalis, *Goods.*	scarce	common	common.
Calanus Clausii, *G. S. Brady* ..	common	scarce	common.
Dias longiremis, *Lilljeborg*.....	common	common ...	common.
Temora Finmarchica, *Gunner* ..	common	scarce	common.
Ichthyophorba hamata, *Lilljeborg*....	common	common	common.
denticornis, *Claus*..			
Anomalocera Patersonii, *Templet.*	frequent	frequent	rare.

Order. CLADOCERA.

Fam. POLYPHEMIDÆ.

Genus. PLEOPIS,* *Dana.*

General form very like *Polyphemus*. *Head* moveable, separated above by a deep impression from the thorax, below thick and

* As defined by G. O. Sars.

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rounded. *Carapace* in adult female having a large round oviferous sac over the thorax. *Abdomen* small, having a little process above bearing two very short pellucid setæ, and terminating in two stiliform nails bending backwards. *First antennæ* rudimentary and alike in both sexes. *Second antennæ* having one branch 3, the other 4-jointed, all the joints—except the very small basal joint of the 4-jointed branch—bearing ciliated but not jointed setæ. *Lip* short and thick, forming a rounded lobe which has its inferior margin sparingly furnished with short spine-like setæ. *Mandibles* moderately large, upper part indistinctly defined, lower strongly bent inwards, forming with the upper part a nearly right angle, attenuated towards the extremity, and ending in two teeth. No *maxillæ*. *Feet* four pairs, all prehensile, and scarcely branchial, basal joint furnished with a small setiferous appendage; first pair longer than the others and more slender, 4-jointed; two last joints small, and bearing long curved setæ; these joints in the male are a little dilated; last joint armed with a small curved nail; second and third pair alike, 4-jointed; basal joint having an appendage on the inner side furnished with terminal spines, and may be compared to the coxal or maxillary (coxali vel maxillari) process in other Cladocera; the setæ of the other joints shorter and more nail-like than in the legs of first pair. Last legs much shorter than the others, and not distinctly articulated. *Eye* very large, entirely filling the fore part of the head, having very numerous and very long crystalline lenses. On the hinder portion of the back of the head there is a distinct *organ of attachment*. *Intestine* simple and nearly straight, and terminates before the caudal stiliform appendages.

1. Pleopis polyphemoides, *Leuckart*. Pl. IV, fig. 14.

Evadne polyphemoides, Leuckart, Weigmann's Archiv. 1859, p. 262, and Ann. & Mag. Nat. Hist., 3rd Series, vol. V, p. 445.

This species occurs mostly at some little distance from land, associated often with *Evadne Nordmanni*, from which it is readily distinguished by the form of the carapace which is rounded below and deeply constricted at the neck. The front of the head is

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almost filled by an immense eye. The abdomen projects anteriorly and is terminated by two strong spines directed downwards, thus giving the lower part of the animal an appearance not unlike that of *Daphnia mucronata*.

Order. COPEPODA.

Fam. HARPACTIDÆ.

Genus. THALESTRIS, *Claus*.

1. Thalestris longimana, *Claus*.

   Claus; Die frei lebenden Copepoden, p. 130, T. XVIII, figs. 1–11.

A single specimen was taken in the towing net off Seaham Harbour.

Fam. PELTIDIDÆ.

Genus. ALTEUTHA, *Baird*.

1. Alteutha bopyroides, *Claus*.

   Claus; Die frei lebenden Copepoden, p. 143, T. XXII, figs. 10–17.

Several examples of this species occurred in a gathering taken three miles off Ryhope, on the Durham coast.

Fam. CALANIDÆ.

Genus. CETOCHILUS, *R. de Vauxème*.

1. Cetochilus septentrionalis, *Goodsir*. Pl. I, fig. 12; and Pl. IV, figs. 11, 12.

   Cetochilus septentrionalis, Goodsir; Edin. New Phil. Jour. XXXV, 339, Pl. VI, figs. 1–11.

   ,, ,, Baird; Nat. Hist. Brit. Entom., p. 335, T. XXX, figs. 1, a–g.

   Cetochilus Helgolandicus, Claus; Die frei lebenden Copepoden, p. 171, T. XXVI, figs. 2–9.

Dr. Claus, in his recent monograph of the Copepoda, describes three species closely allied to the *C. septentrionalis* of Goodsir,

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two of these being from Messina, the other from the North Sea. There can, I think, be no reasonable doubt, that the latter is the species referred to by Goodsir, and I therefore here retain the original name as having the claim of priority. The chief characters by which Dr. Claus distinguishes his northern species, *C. Helgolandicus*, from the southern *C. longiremis*, are the distribution of setæ on the apical joints of the upper antennæ (fig. 11) and the presence, in the former species, of a serrated inner border to the basal joints of the fifth pair of feet (fig. 12). In these particulars the species here recorded agrees with *C. Helgolandicus*. It is one of the commonest forms on our coast, occurring abundantly both in pelagic and littoral situations.

Genus. CALANUS, *Leach*.

Fifth thoracic segment indistinct, united with the fourth. *Superior antennæ* 25-jointed, sometimes (two of the joints being soldered together) 24-jointed; those of the male thickened but not hinged. *Inferior antennæ* and *maxillary* organs like those of Cetochilus. *Fifth feet* consisting of one branch; those of the male nearly alike; sometimes altogether absent in the female. *Abdomen* of the male composed of five; of the female, of four (or three) segments. *Eyes* simple, small.

1. Calanus Clausii, n. sp. Pl. I, figs. 1–11, 13.

Body elongated, about one-twentieth of an inch long (without the tail setæ), colourless and fragile. *Superior antennæ* 24-jointed, (the eighth and ninth of the twenty-five joints being fused together,) a little longer than the cephalothorax; the two terminal articulations contracted at the base and somewhat swollen at the distal extremities: the upper or outer edge is beset with short hairs, and the joints in the male are irregularly swollen, the third to the sixth or seventh having each a stronger and longer hair than the rest. *Inferior antennæ* two-branched, the secondary branch with four short median articulations. *Cephalothorax* oval in outline, rounded above, the last segment conspicuously indented or umbilicate at its junction with the abdomen. *Swimming feet* slender, the inner branch two, the outer three-jointed, except the first pair, the inner branch of which has only one (?) joint. *Fifth*

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pair of feet, in the male long and slender, pointed; the left consisting of three cylindrical tapering joints, of which the middle is the longest; the right composed of five joints, of which the first three are nearly equal, the fourth shorter, and the fifth very small and sharp. The fifth pair in the female is obsolete. First abdominal segment, in the female, very tumid in front. Terminal abdominal segments very short. Caudal setæ short; about half the length of the abdomen.

This species was doubtfully referred, in a previous report, (Trans. Tyneside Nat. Field Club, vol. VI, p. 188,) to *Phäenna spinifera*, Claus; but Dr. Claus has kindly examined specimens which I forwarded to him, and pronounced them to belong to a hitherto undescribed species, referable to the genus *Calanus*, from which it differs, however, in the absence of the fifth pair of feet in the female. To meet this peculiarity I have slightly modified the definition of the genus here given. The species is peculiarly difficult to examine satisfactorily on account of its extreme fragility, it being scarcely possible, in any of my gatherings, to find an unmutilated specimen. By far the greater number are females devoid of the rudimentary feet, but some rare specimens showed these organs in a peculiar form (plate I, fig. 11), which I at one time supposed to belong to the female. Dr. Claus has, however, pointed out to me that these are in reality the fifth feet of the immature male, and that where they occur there are always corresponding marks of immaturity in the development of the abdominal segments.

C. Clausii is an abundant and widely-spread species, occurring both in tidal pools and in the open sea. I have specimens from Shetland and the Channel Islands, and from many localities, both littoral and pelagic, in the Northumberland and Durham districts.

I have much pleasure in dedicating this interesting species to Dr. Claus, and I regret that the imperfect state of my specimens has prevented my figuring it as fully and accurately as I could have wished.

GENUS. DIAS, *Lilljeborg*.

Anterior antennæ composed of 19–21 joints, beset with long

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setæ; that of the male having, on the right side, a hinge joint. *Posterior antennæ* with a short, simple secondary branch. *Labrum* large, three lobed. *Anterior foot-jaws* strong, with ciliated, uniciform setæ; *posterior foot-jaws* slender, armed with setæ at the base; *swimming feet* elongated, inner branch two-jointed. *Fifth pair* of feet having one branch, the *right* of the male formed for prehension. Abdomen of the male 5, of the female 3-jointed.

1. Dias longiremis, *Lillj.* Pl. I, fig. 14; and Pl. II, figs. 11–18.

Dias longiremis, Lilljeborg; De Crustaceis ex ordinibus tribus (1853), p. 181, T. XXIV, figs. 1–13.

,, ,, Claus; Die frei lebenden Copepoden (1863), p. 193, T. XXXIII, figs. 6–14.

Calanus Euchæta, Lubbock; Ann. & Mag. Nat. Hist., 2nd Series. Vol. XX (1857), p. 401. Pl. X, figs. 1–6.

Body elongated, slender. Head obtusely rounded. Antennæ about as long as the cephalothorax, the right of the male having 19, the left 21 joints. First segment of the body nearly as long as the remaining four segments. Caudal segments short, about once and a half or twice as long as broad. Tail setæ equal in length to the abdomen, the second from the inner side being the longest. Length $\frac{1}{20}$th of an inch. This species may at once be recognized by the peculiarity of the larger antennæ which are irregularly swollen at the articulations so as to give them a gnarled or knotted appearance (figs. 11–13). About one half of the antennal setæ are much larger than the rest, being distributed at irregular intervals, but most profusely near the apex of the antennæ. The lower antenna (fig. 4) is two branched, the larger branch three-jointed, and having on the basal joint a series of eight hairs which increase regularly in length from the first to the fifth or sixth. The cephalothorax has often a few minute spines on the posterior border of the last segment. These are variable in number: most of my specimens possess two or three, but some have none. The fifth feet of the male consist each of a single four or five-jointed branch, forming a pair of strong prehensile claws (fig. 18). The fifth foot in the female (fig. 17)

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is much smaller and is made up of a short basal portion, from which springs a long, gradually attenuated apical joint. From the basal joint there is given off on one side a long seta. The terminal spines of the swimming feet (plate I, fig. 14) are peculiar; for instead of having one or more small supplementary spines at the base connected with the first joint of the foot by a moveable joint, as is usually the case, the spine is in this species formed by a mere arched and pointed prolongation of the outer edge of the foot.

D. longiremis seems to be one of the commonest and most widely distributed of our native Calanidæ. It occurs abundantly in a gathering taken off the Durham coast; also at the Fern Islands, and in the open sea one hundred miles off Tynemouth. Mr. Norman has taken it at Rothesay, Mr. Lubbock at Weymouth, and I have myself found it amongst the Channel Islands, in the Isle of Man, in tidal pools on the Durham coast, and in pools of brackish water on Burgh Marsh, near Carlisle. The specimens taken in the last-named locality are, however, stunted and ill-developed, being only about $\frac{1}{3}\frac{1}{5}$th of an inch in length, the result, I suppose, of an uncongenial habitat.

Genus. TEMORA, *Baird.*

Superior antennæ 24-jointed, the right in the male having a hinge joint. Branches of the inferior antennæ subequal: the secondary branch with four short median joints. Inner branch of the first pair of feet one-jointed; of the second, third, and fourth pairs two-jointed. Fifth feet consisting of one branch; in the female short and rudimentary; in the male prehensile, and, on the right side, subcheliform. Abdomen of the male 5, of the female 3-jointed.

1. Temora Finmarchica, *Gunner.* Pl. I, fig. 15; and Pl. II, figs. 1–10.

   Monoculus Finmarchicus, Gunner; Act. Hafn. X 175, f. 20–23. 1765.

   Temora Finmarchica, Baird; Nat. Hist. Brit. Entom., p. 228, T. XXVIII, figs. 1, 1 a–g.

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Temora Finmarchica, Claus; Die frei lebenden Copepoden, p. 195, T. XXXIV, figs. 1–11.

Diaptomus longicaudatus, Lubbock; Ann. & Mag. Nat. Hist., 2nd Series. Vol. XX (1857), p. 405. Pl. X, figs. 11, 12; and Pl. XI, figs. 12, 13.

Body broad in proportion to its length; posterior margin of cephalothorax very much arched. Anterior antennæ rather longer than the cephalothorax. Anterior angle of the last thoracic segment rounded. Fifth feet short, composed of a single branch; in the male subchelate. Caudal segments very long and slender, about nine times as long as broad and nearly equal in length to the abdomen. Terminal setæ shorter than the caudal segments. Colour brown. Length $\frac{1}{20}$th of an inch.

The exceedingly long and slender caudal segments (fig. 7), which bear a slender spine on their outer margin at about one fourth of their length from the apex, the strongly arched dorsal outline, and the absence of spines on the inferior angles of the cephalothorax, sufficiently distinguish this from every other species. The fifth foot of the female (fig. 10) is very short, composed of three cylindrical joints, the last of which is armed with four short spines, two at the apex and two at the sides. That of the male (figs. 8, 9) is also short, and consists of one four-jointed branch, the antepenultimate being produced into a strong spine which, when in apposition with the apical joint, forms a prehensile claw. This is developed much more fully on the left than on the right side. The antero-inferior angle of the last cephalothoracic segment is well rounded off; the posterior angle is directed downwards and forms an obtuse angle.

This is, I think, the most abundant, and the most widely distributed of all the British species. It occurs often in immense numbers in tidal pools, as well as in the open sea. The following are the localities from which I have obtained specimens:—The Channel Islands, Northumberland and Durham coasts, Rothesay, and Shetland. For specimens from the two last-mentioned places I am indebted to the Rev. A. M. Norman.

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2. TEMORA VELOX, *Lilljeborg*. Pl. I, fig. 16; and Pl. III, figs. 1–11.

Lillj.; De Crust. ex ordinibus tribus Clad., Ostrac., et Copep., p. 177, T. XX, figs. 1–9; and T. XIX, figs. 9, 10.

Cephalothorax strongly arched dorsally. First segment about equal in length to the following three. Superior antennæ as long as the cephalothorax, very stout, and of nearly equal thickness throughout. Inferior angle of the body produced into a spine. Fifth pair of feet, in the male, very large and strong. Caudal segments of moderate length. Tail setæ about half the length of the abdomen. Length $\frac{1}{17}$th of an inch.

This fine species does not, strictly speaking, come within the limits of a dredging report, seeing that we have found it only in brackish water and never in the open sea. But as it has not yet been noticed by any British author (except casually by myself in the Report of the British Association for 1863) it seems desirable to describe it here as being nearly related to the other subjects of this paper. The upper antennæ are remarkably stout, thickened at the base, and beset along the upper margin with numerous short hairs. That of the male, on the right side (fig 2), has two long terminal joints, at the base of which the "hinge" is placed. The two joints above, and one below the hinge are armed with serrated plates. The 11th, 12th, 13th, and 14th joints have each usually a distinct but short spine; the 15th and 19th are also armed in the same way, but their spines are much longer. These are not shown with sufficient clearness in the plate. The fifth feet in the female (fig. 9) are four-jointed, the apical joint rounded, small, and having two stout setæ, one large and one small; the penultimate joint has one or two setæ, and is produced at the inferior angle into a strong spine, which is sometimes serrated on the lower border. The second joint bears also a slender bristle. The fifth feet of the male (fig. 10) are very large and powerful, and are provided on their opposing edges with several spines—mostly one in the middle of each joint. The last abdominal and the caudal segments (fig. 11) are beset with irregularly scattered short hairs or prickles. The caudal

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segments are four times as long as broad, and about equal in length to the terminal setæ.

I first recognized this species from specimens taken by the Rev. A. M. Norman in the Isle of Cumbrae, in a pool above ordinary high-water mark, and into which the sea found access only at spring tides. Since that time I have myself taken it in immense numbers in brackish pools at Hylton Dene near Sunderland, and at Burgh Marsh near Carlisle, and I have also seen a few examples collected by Mr. Norman in brackish water at Hartlepool. When living the animal is of a pale brown tint, but on immersion in spirit, assumes a peculiar vinous red or purple.

GENUS. ICHTHYOPHORBA, *Lilljeborg*.

Head more or less distinct from the thorax. Superior antennæ 24-jointed, the right of the male having a hinge joint. All the feet two-branched; branches three-jointed. Fifth pair of feet in the male prehensile, the inner branch formed for swimming. Abdomen of the male 4 or 5, of the female 3-jointed; much more slender than the body.

1. ICHTHYOPHORBA HAMATA, *Lilljeborg*.

Ichthyophorba hamata, Lillj.; De Crust. ex ordinibus tribus (1853), p. 185, T. XXI, figs. 1–5, and 7-9; and T. XXII, figs. 9–12.

I. angustata, Claus; Die frei lebenden Copepoden (1863), p. 199, T. XXXV, figs. 2, 10–12.

Diaptomus Bateanus, Lubbock; Ann. & Mag. Nat. Hist. 2nd Series, vol. XX (1857), p. 404. Pl. XI, figs. 1–3.

Body slender. Superior antennæ slender, as long as the whole body, destitute of spines. Right antenna of the male slightly swollen in the middle. Inferior angle of the last cephalothoracic segment produced into a hook-shaped spine. Fifth pair of feet two-branched; the external branch of the right foot in the male terminating in two slender curved claws, the outer of which is the longest, and is armed with two or three short, sharp spines. Outer branch of the left foot two-jointed. Outer branch of the fifth foot, in the female, armed with a long and strong spine projecting inwards from the second joint. Tail segments of moderate

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length, about once and a half as long as the last abdominal ring. Colour brown. Length $\frac{1}{15}$th of an inch.

I. hamata is pretty widely distributed, at any rate, on our eastern shores; where it occurs both in tidal pools and in the open sea. It is, however, not very commonly taken between tide marks; neither in the open sea is it so abundant as many other species. The following are the localities in which it has been taken:—Shetland, Northumberland and Durham (both littoral and pelagic), Channel Islands; Weymouth (Mr. Lubbock).

2. ICHTHYOPHORBA DENTICORNIS, *Claus*.

Claus; Die frei lebenden Copepoden, p. 199, T. XXXV, figs. 1, 3–9.

Superior antennæ as long as the body, bearing a strong pointed tooth on the upper border of the 1st, 2nd, and 5th joints. Right antenna of the male much swollen in the middle, armed with a strong spine on the joint next above the uppermost serrated plate, and with three or four smaller teeth on the preceding joints. Lower anterior angle of the cephalothorax produced into a strong tooth. First segment of the female abdomen bearing on the right side two long, slender spines connected with the papilla for the attachment of spermatophores. Fifth pair of feet similar to those of *I. hamata*, but the inner claw of the right foot possesses at its extremity, a row of blunt serrations, and the outer branch of the left foot is 3-jointed.

The genus *Ichthyophorba* was established by Lilljeborg in his work (published in 1853), "De Crustaceis ex ordinibus tribus Cladoceris, Ostracodis et Copepodis in Scaniâ occurrentibus." In this work one species only, *I. hamata*, was described. Dr. Claus in his recent work on the Copepoda has described an additional species, *I. denticornis*, substituting at the same time for Prof. Lilljeborg's specific name *hamata*, that of *angustata*, under the impression that the species referred to by Lilljeborg might not be identical with the new "*angustata*." There seems, however, little room to doubt that the species described by the two authors are one and the same, and I have therefore here adopted the older name. In our seas, *I. hamata* is much the commoner form.

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Report on the Pycnogonoidea, by George Hodge.

Seven species were obtained during the present year's dredging, six of which had been taken on previous years, and one (*Nymphon rubrum*) is new to science.

Ten species have been taken during the three years, mostly of the larger forms—a small number, it must be confessed, but there are perhaps few animals more difficult of detection: their limbs closely resemble the stems of Sertularian Zoophytes, and unless they move there is every chance of the smaller forms being passed over whilst the dredged material is being searched. This, I apprehend, has actually been the case; for, owing to the pressure of work during the second and third trips, in consequence of there being so few dredgers, attention was chiefly directed to the more readily noticed forms of life. This is much to be regretted in the case of the Pycnogons, for it is amongst the smaller individuals that new and rare species may be expected.

The result of each year's dredging may be thus stated:—

	1862.	1863.	1864.
Pycnogonum littorale, *Ström*	*	*	*
Phoxichilidium coccineum, *Johnston*	*	..	..
petiolatum, *Kröyer*	*	*	..
Nymphon gracile, *Leach*	*	..	*
grossipes, *O. Fabr.*	*	..	*
giganteum, *Johnston*	*	..	*
hirtum, *O. Fabr.*	*	..	*
brevitarse, *Kröyer*	*	..	*
brevirostre, *Hodge*	*	..	..
rubrum (n. s.), *Hodge*	..	..	*
	9	2	7

In my report on the Pycnogons, dredged in 1862, I included *Nymphon femoratum*, Leach: subsequent examination, however, has convinced me that the specimen in question is merely a slightly modified form of *N. hirtum*, O. Fabr., and that Leach's species is identical with it.

Nymphon rubrum, Hodge, n. sp. Pl. X, fig. 1.

Body moderately stout. Lateral abdominal processes distant, half as long again as broad. Rostrum short, stout, not equal to length of first joint of foot-jaws. Palpi equal in length to first

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joint of foot-jaws. Legs long, furnished with short spines, first and third joints equal, second as long as both, fourth longer than three first, fifth longer than fourth, sixth longer than fifth. Tarsus as long or slightly longer than hand, with a strong spine at joint on inner side. Hand slightly curved, with four large spines and a few hairs along margin. Claw about half the length of hand; auxiliary claws more than half the length of claw. Colour of body bright red, banded with red of darker colour.

Durham coast; a single specimen from deep water.

Report on the Echinodermata, by George Hodge.

The following tabular statement exhibits the result of the three years' dredgings. It contains 38 species, of which

27	were obtained in	1862, viz.,	21	from Northd. coast and	8	from Dogger Bank.			
27	„	1863, „	21	„	„	„	19	„	Durham coast.
32	„	1864, „	31	„	„	„	20	„	„ „

The result geographically may be thus stated:—

Dogger Bank	8 species.
Northumberland coast	36 „
Durham coast	24 „

It will be observed that the Durham coast bears an unfavourable comparison with that of Northumberland. Such comparison is however scarcely fair, as much more time was spent on the latter; in fact, very little dredging was done on the Durham coast, and that little under unfavourable circumstances. In each case the wind and sea were so rough that the dredges could not be satisfactorily worked; but for this, the result would probably have been scarcely inferior to the northern localities dredged.

Five additional species were obtained in 1864, of which one, *Thyone flexus* (Hodge), is new to science, and one *Echinocardium pennatifidum* (Norman) is a great rarity. The latter species was first made known as an inhabitant of the British seas, under the name of *Amphidotus gibbosus*, from a single specimen dredged in Shetland several years ago by the late Mr. Barrett, and by him considered identical with *Amphidotus gibbosus* of Agassiz. The

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Rev. A. M. Norman has however made a careful examination of the Northumbrian specimen, and also of one sent him from the Clyde, which he finds do not agree with the original description of Agassiz, although they do with that of Barrett, the inference being that the latter author was incorrect in referring his specimen to the species described by Agassiz. Mr. Norman has accordingly re-named Barrett's specimen, or rather corrected his name, for the specimen cannot be found.

Two species obtained in 1863, viz., *Ophiura squamosa* and *Echinus Dröbachiensis*, were not taken during the present year, although we dredged the localities in which they were previously found, at least so far as we could judge. In the case of the latter species this is the more remarkable, as it was taken in great numbers at a spot near the Fern Islands, which afforded capital landmarks. The Ophiura being rare, and only obtained several miles from land in deep water, there was much greater difficulty in determining the actual spot. These are instances of the uncertainty of dredging, even when weather and sea are favourable.

Six species have been added to our local Fauna, viz., *Stichaster roseus*, *Echinus Dröbachiensis*, *E. pictus*, *Echinocardium pennatifidum*, *Thyonidium hyalinum*, and *Thyone flexus*, certainly a satisfactory result.

The arrangement and nomenclature here adopted is that recently proposed by the Rev. A. M. Norman,* which meets a want long felt by British naturalists, who have hitherto been far behind continental authors in their classification of these animals. I therefore considered it advisable to adopt his system in this the final dredging list, more especially as it will be used in my Catalogue of the Echinodermata of our district. I would also take this opportunity of recording my obligations to Mr. Norman for much valuable assistance, more especially in examining the doubtful specimens of Holothuria, when he pointed out the distinct characters of *Thyone flexus* now described for the first time.

* On the Genera and Species of British Echinodermata, by the Rev. A. M. Norman, M.A. Annals and Magazine of Natural History, February, 1865.

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Thyone flexus, Hodge. Pl. X, figs. 2–14.

Body about five times as long as thick, very slightly tapering towards the hinder part; feet very numerous, thickly covering the entire animal with the exception of a small space near the anterior end. Length barely one inch, and about $\frac{3}{16}$ths of an inch thick. Colour light dusky brown, the anterior end being of a lighter hue.

Body spicules (or plates) of varying forms and dimensions; perforations round or slightly oval; on their first formation four such perforations are arranged round two nodules, which, when viewed sideways, are seen to be two stalks meeting at the top and terminating in several minute points; in some cases, that of large plates, three of these "nodules" are present. The prevailing shape of the plates nearly square, with eight perforations. This form is however soon lost in the further growth of the plate, which seldom again presents any regular outline. Feet spicules much curved, the convex or upper part being produced into two stalks meeting at the tips, and having a triangular opening between them. Each foot furnished with a plate at the extremity, irregular in outline, with numerous irregular perforations, the larger being concentrically arranged.

	1862.		1863.		1864.		Remarks.
	Northumberland.	Dogger Bank.	Northumberland.	Durham.	Northumberland.	Durham.	
Antedon rosaceus, *Linck* ...	..	..	..	..	*	..	Rare.
Ophiothrix fragilis, *Müller*..	*	*	*	*	*	*	Very common.
Amphiura filiformis, *Müller*	..	*	*	*	*	*	Frequent.
Chiajei, *Forbes* ..	..	..	..	*	*	*	Rather rare.
Ballii, *Thompson*.	*	..	*	*	*	*	Very frequent.
Ophiocoma nigra, *Müller* ..	..	..	*	.	*	..	Partial in distribution.
Ophiopholis aculeata, *Müller*	..	*	*	*	*	*	Rather rare.
Ophiura lacertosa, *Pennant*..	..	*	*	*	*	*	Frequent in deep water.
albida, *Forbes*	*	*	*	*	*	*	Very common.
affinis, *Lütken*	..	*	*	..	*	*	Common.
squamosa, *Lütken*..	..	..	*	..	..	..	Rare.
Astropecten irregularis, *Pen.*	*	.	*	*	*	*	Frequent.
Luidia Sarsii, *Düben & Koren*	*	..	*	*	*	*	Rather rare.
Solaster papposus, *Linnæus*..	*	..	*	..	*	*	Frequent.

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	1862.		1863.		1864.		Remarks.
	Northumberland.	Dogger Bank.	Northumberland.	Durham.	Northumberland.	Durham.	
Solaster endeca, *Linnæus* ..	..	*	..	..	..	*	Frequent.
Cribrella sanguinolenta, *Mül.*	*	..	*	..	*	..	Frequent.
Stichaster roseus, *Müller* ..	*	..	..	..	..	..	Very rare.
Asterias Mülleri, *Sars*.....	*	..	..	*	..	..	Rare.
rubens, *Linnæus* ..	*	..	*	*	*	*	Very common.
Echinus esculentus, *Linnæus*	*	..	*	..	*	..	Common.
miliaris, *Gmelin* ..	*	..	*	..	*	*	Common.
pictus, *Norman*....	..	..	..	..	*	*	Frequent.
Dröbachiensis, *Mül.*	*	..	*	..	..	..	Abundant inside Fern Islands.
Echinocyamus pusillus, *Mül.*	*	..	*	*	*	*	Abundant.
Spatangus purpureus, *Müller*	*	..	*	*	*	*	Frequent.
Brissopsis lyrifera, *Forbes* ..	*	..	..	*	*	*	Frequent in deep water.
Echinocardium cordatum, *Pennant*	..	..	..	*	*	..	Rather rare in depths dredged.
ovatum, *Les*.....	*	..	*	*	*	*	Very common.
pennatifidum, *Nor.*	..	..	..	..	*	..	Very rare.
Cucumaria elongata, *D. & K.*	..	..	.	*	*	..	Rather rare.
lactea, *For. & Good.*	*	..	..	..	*	..	Rather rare.
Thyonidium hyalinum, *Forbes*	*	..	..	..	*	..	Rare.
commune, *F. & G.*	..	*	.	..	.	..	Rare.
Thyone fusus, *Müller*	*	..	..	*	*	*	Frequent.
raphanus, *D. & K.*..	..	..	*	*	*	..	Rather rare.
flexus, *Hodge*.....	..	..	..	..	*	..	Rare.
Psolus phantopus, *Linnæus*..	*	..	..	..	..	..	Rare.
squamatus, *Koren* ..	..	..	..	.	*	..	Rare.
	21	8	21	19	31	20	
	27		27		32		

Report on the Zoophytes, by Joshua Alder.

The Zoophytes dredged during these excursions were, upon the whole, good, and in considerable abundance, especially those got in the last year's dredgings on the Northumberland coast. Several fine examples of *Sertularia fusca* were then obtained. This interesting and local species, hitherto considered rare, proves to be more abundant on our coast than was at first expected. The rare and beautiful *Plumularia myriophyllum* was got in this locality for the first time, as was also the *Tubiclava cornucopiæ*, a

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species lately discovered by Mr. Norman in Shetland, and described by him in the "Annals of Natural History" for January, 1864. It was found on the posterior end of a *Dentalium entalis*, which appears to be its favourite habitat. A single specimen of *Halecium labrosum* was also met with. This species, first described by me from a specimen got on this coast, has since been obtained by Mr. Peach at Wick. It is probably a northern form. The delicate little *Halecium tenellum*, met with in the expedition of 1862, did not occur in the later dredgings. *Plumularia pinnata* was very fine and abundant.

A beautiful new Medusa, got in 1862, is described in the present volume by Mr. Norman.

Turning to the Polyzoa, we find *Scrupocellaria Delilii* recorded for the first time as British in the dredging list for 1863. I had observed it previously, and have since published a description of it in the "Microscopical Journal" for April, 1864.* *Tubulipora lobulata*, *Hippothoa divaricata*, *Membranipora imbellis*, and *Lepralia annulata* are likewise additions to our local Fauna; the latter a rare and beautiful species. *Bugula fastigiata*, obtained sparingly in the first expedition, was found to be more plentiful in the last. *B. Murrayana* was also plentiful. These are the most characteristic northern forms of the genus. A specimen of what appears to be a variety of *Eschara Skenei*, got in the last dredgings, is much more broadly foliaceous than is usual in that species, and may possibly be the *Eschara cribraria* of Johnston. This latter is still involved in some obscurity; but broadly expanded specimens which I have obtained from the deep-water boats on this coast, in a similar worn state to Dr. Johnston's type in the British Museum, favour the supposition of its being a variety of *E. Skenei*. The *Cellepora dichotoma*, lately described by Mr. Hincks, proves to be equally common on our coast with *C. ramulosa*, with which it had formerly been confounded. The same may be said of *C. avicularis*, Hincks, as compared with *C. pumicosa*. A single example of *Cellepora Hassallii* was got encrusting the stem of *Plumularia falcata:* this has usually been considered a littoral species.

* See also page 63 of this volume.

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The numbers of the different classes obtained were:—

Polyzoa	53
Hydrozoa	57
Actinozoa	10
	120

Many of the best species met with are known to be northern forms, but the published lists of species in these classes are so incomplete that it would be very unsatisfactory to attempt a numerical comparison.

The flexible Zoophytes, from their perishable nature, are not often preserved in a fossil state. The calcareous species indeed occur, but generally mutilated and imperfect. Ten species only of the 53 Polyzoa dredged are found fossil in the Crag. The calcareous Actinozoa are abundant in a fossil state; but none of that division of the class are inhabitants of our coast.

ZOOPHYTES.

POLYZOA.

	1862.		1863.		1864		Remarks.
	Northumberland.	Dogger Bank.	Northumberland.	Durham.	Northumberland.	Durham.	
Salicornaria farciminoides, *Johns.*	*	..	*	*	*	*	
sinuosa, *Hassl.*	..	..	..	..	*	..	Rare.
Cellularia Peachii, *Busk.*	*	*	*	..	*	*	Not uncommon.
Menipea ternata, *Ellis & Sol.*	..	*	*	..	..	..	
Scrupocellaria scruposa, *Lin.*	*	..	..	*	*	*	Common.
Delilii, *Aud.*	..	..	..	*	..	*	Rare.
Hippothoa divaricata, *Lamx.*	..	..	.	..	*	..	
Gemellaria loricata, *Linn.*	*	..	..	*	*	*	Common in the last dredging.
Bugula flabellata, *J. V. Thom.*	..	..	*	..	*	..	
avicularia, *Pall.*	..	..	..	..	*	*	
Murrayana, *Bean.*	*	*	..	*	*	*	Not uncommon.
fastigiata, *Fab.*	*	*	..	..	*	*	Not uncommon.
Flustra foliacea, *Linn.*	*	..	*	..	*	*	
truncata, *Linn.*	*	..	..	..	*	*	Common in the last dredging.
Carbasea papyrea, *Pallas*	*	..	..	..	*	.	
Membranipora pilosa, *Pall.*	*	..	*	..	*	*	
Flemingii, *Busk*	*	..	..	..	*	*	
rostrata, *Ald.* m.s. (Flemingii, var. *Busk.*)	..	..	*	..	..	..	

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	1862.		1863.		1864.		Remarks.
	Northumberland.	Dogger Bank.	Northumberland.	Durham.	Northumberland.	Durham.	
Membranipora Lacroixii, *Au.*	..	..	..	..	*	..	Rare.
Pouilletii, *Aud.*	*	..	*	..	*	..	
craticula, *Alder*	..	..	.	..	*	..	
unicornis, *Flem.* (*Ald.*)	..	..	*	..	*	..	
imbellis, *Hincks*	..	..	..	..	*	..	
Lepralia auriculata, *Hassall*	..	..	..	..	*	..	
concinna, *Busk.* ..	*	..	*	..	*	..	Not uncommon.
trispinosa, *Johns.*..	*	..	*	..	*	*	Common.
linearis, *Hassall* .	*	..	..	..	*	..	
coccinea, *Abildg.*..	*	..	..	..	..	..	
ciliata, *Pallas*	..	..	*	..	*	..	
annulata, *Fabr.* ..	..	.	..	..	*	..	Two specimens.
Peachii, *Johns.* ..	*	..	*	..	*	..	
punctata, *Hass.* ..	..	..	..	*	..	..	
ventricosa, *Hass.*..	*	..	..	..	*	..	
Malusii, *Aud.*	..	..	*	..	*	..	
Cellepora pumicosa, *Linn.* ..	*	*	*	*	*	*	Common.
avicularis, *Hincks.*	..	*	*	*	*	..	In the first dredgings regarded as a variety of *C. pumicosa.*
Hassallii, *Johns.* ..	..	..	..	..	*	..	
ramulosa, *Linn.* ..	*	..	*	..	*	..	
dichotoma, *Hincks.*	..	..	*	..	*	*	
Eschara skenei, *Ellis & Sol.*..	*	..	..	..	*	*	
Tubulipora patina, *Linn.* ..	*	..	..	..	*	*	
hispida, *Flem.* ..	*	..	*	*	*	*	
lobulata, *Hass.*..	..	..	..	..	*	..	
flabellaris, *Fabr.*	..	..	..	..	*	..	
serpens, *Linn.* ..	*	*	*	*	*	*	Common.
Alecto major, *Johns.*	*	..	..	..	*	..	
dilatans, *Johns.*.....	..	..	*	..	..	..	
Crisia eburnea, *Linn.*	*	*	*	*	*	*	Common.
Crisidia cornuta, *Linn.*	..	..	*	..	..	..	
Alcyonidium gelatinosum, *Pall.*	*		*		*		
parasiticum, *Flem.*	*	..	..	*	*	*	
mammillatum, *Ald.*	..	..	..	..	*	..	
Pedicellina echinata, *Sars* ..	*	..	*	..	..	*	
HYDROZOA.							
Tubiclava cornucopiæ, *Norm.*	..	..	..	..	*	..	One specimen on *Dentalium entalis.*
Hydractinia echinata, *Flem.*	..	..	..	..	*	*	
areolata, *Alder.*	..	..	..	*	..	..	One specimen on *Natica Alderi.*
Atractylis minutus, *Allm.* (?)	*	..	*	..	..	..	

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	1862.		1863.		1864.		Remarks.
	Northumberland.	Dogger Bank.	Northumberland.	Durham.	Northumberland.	Durham.	
Atractylis ——— (?)	*	..	..	..	*	..	
Eudendrium rameum, *Pallas.*	*	..	..	..	*	..	
capillare, *Alder.*	*	..	..	..	..	..	
———, (?)..	..	..	*	..	*	..	A small species not made out.
Tubularia indivisa, *Linn.* ..	*	..	*	*	*	*	
gracilis, *Harvey*..	*	..	*	*	*	*	Common.
larynx, *Ellis*	..	..	*	.	..	..	
simplex, *Alder* ..	*	..	..	..	*	..	
gigantea, *Lamx.*..	*	..	..	..	..	..	Perhaps a var. of *T. indivisa.*
Halecium halecinum, *Ellis*..	*	*	*	*	*	..	
Beanii, *Johns*.....	*	..	..	*	*	..	Frequently parasitical on last.
labrosum, *Alder*..		..	..	..	..	*	One specimen.
muricatum, *Ellis.*	*	..	..	..	..	.	
tenellum, *Hincks.*	*		..	..	..	..	Rare.
Sertularia polyzonias, *Linn.*	*	..	*	*	*	*	
tricuspidata, *Ald.*	*	..	..	..	..	..	Rare.
tenella, *Alder* ..	*	*	*	..	*	..	
Gayi, *Lamx.*	..	..	..	..	*	*	
rugosa, *Ellis*	*	*	..	*	*	*	
rosacea, *Linn.* ..	*	..	*	..	*	*	
pinaster, *Ellis & S.*	*	*	..	..	..	..	Rare.
fallax, *Johns*.....	..	..	..	..	*	*	Not uncommon in the dredging of 1864.
tamarisca, *Linn*...	*	..	*	..	*	..	
abietina, *Linn.* ..	*	*	*	*	*	*	Common.
filicula, *Ellis & Sol.*	*	*	*	..	*	*	
argentea, *E. & S.*	*	..	*	..	*	..	
fusca, *Johns.*	*	..	*	..	*	*	Several specimens in 1864.
Thuiaria thuia, *Linn.*	*	..	*	*	*	*	
Antennularia antennina, *Lin.*	*	..	..	*	*	*	Common.
ramosa, *Lamx.*	*	..	..	*	*	*	
Plumularia falcata, *Linn.* ..	*	*	*	*	*	*	Very common.
myriophyllum, *Lin.*	..	..	..	..	*	..	One specimen.
pinnata, *Linn.*	*	*	*	*	*	*	
setacea, *Ellis*.....	..	..	..	*	..	*	On *Antennularia ramosa.*
Catharina, *Johns*...	*	*	*	*	*	*	
frutescens, *E. & Sol.*	*	..	..	..	*	*	Rare.
Laomedea longissima, *Pallas.*	*	..	*	..	*	*	Rather common.
dichotoma, *Linn*...	..	..	*	..	..	..	
geniculata, *Linn.*	*	..	..	..	*	*	On *Flustra foliacea.*
Campanularia volubilis, *Lin.*	*	*	*	*	*	*	On *Sertularia abietina* & *Plumularia falcata.*

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	1862.		1863.		1864.		Remarks.
	Northumberland.	Dogger Bank.	Northumberland.	Durham.	Northumberland.	Durham.	
Campanularia Johnstoni, *Al.*	*	*	*	*	*	*	Common.
raridentata, *Ald.*	*	*	..	..	..	..	
Hincksii, *Alder.*	..	..	*	:	*	*	
verticillata	..	..	..	..	*	*	
Lafœa (Calycella) dumosa, *Flem.*.....	*	*	*	*	*	*	
fruticosa, *Sars* (gracillima, *Alder*)	..	..	..	..	..	*	
Calycella syringa, *Linn.*.....	..	*	*	..	*	*	
lacerata, *Johns.* ..	..	..	..	..	..	*	
humilis, *Hincks* ..	*	*	..	..	.	*	
Reticularia serpens, *Hassall.*	*	*	*	*	*	*	Common.
Coppinia arcta, *Dalyell*	..	*	*	*	*	*	
Cyanea capellata, *Linn.*	*	..	..	..	..	..	
imporcata, *Norman*..	*	..	..	..	..	..	A new species.

ACTINOZOA.

Phellia gausapata, *Gosse*....	*	..	..	..	..	..	
Bolocera Tweediæ, *Johns*.....	..	*	..	..	..	..	
Stomphia Churchiæ, *Gosse*..	*	*	..	..	..	..	
Tealia digitata, *Müller*	*	*	..	..	..	..	
Zoanthus Couchii, *Johns*, var. incrustatus, *Sars*	..	*	..	..	..	..	
Pennatula phosphorea, *Linn.*	*	*	..	*	*	*	
Virgularia mirabilis, *Linn*...	*	*	..	..	*		
Alcyonium digitatum, *Linn.*	*	*	*	*	*	*	
glomeratum (*?*)	*	*	..	..	..	..	
Beroe (?)	*	*	..	..	..	..	

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Report on the Foraminifera, by Henry B. Brady, F.L.S.

Portions of the sand and mud from many of the localities at which the dredging was prosecuted, were brought home for examination with respect to the microzoa, chiefly Foraminifera, which they might contain. The material thus preserved varied both in quantity and character with the nature of the area dredged, and in 1863 was insufficient to yield very satisfactory results, besides being rough and gravelly, and unfavourable to the existence of minute and delicate structures. This will account for the smaller number of species recorded for that year.

Of the 112 specific and varietal forms of Foraminifera known to inhabit the British seas 70 will be found in the annexed list. Two of these, a thin-walled, large-pored *Uvigerina*, which has been named *U. irregularis*, and a delicate *Textularia*, with the earlier chambers assuming a spiral mode of growth, named in the list *T. complexa*, are hitherto undescribed. Detailed descriptions and figures of them are given in the "Catalogue of the Recent Foraminifera of Northumberland and Durham," which appears in the present volume. Three species, viz.: *Truncatulina refulgens*, Montfort; *Spiroloculina excavata*, D'Orb.; and *Nonionina scapha*, F. & M., are now for the first time recorded as British, though there is little doubt that the first two are widely distributed on our coast.

There are four other forms which are not noticed by Professor Williamson in his work on the British Recent Foraminifera, but which have since been added to our fauna on the strength of specimens taken off the Shetland Islands. These are, *Lituola scorpiurus*, Montfort (small and rare); *Lagena distoma*, P. & J. (frequent); *Bigenerina digitata*, D'Orb. (one or two broken specimens only); and *Bolivina punctata*, D'Orb. (a few feeble specimens).

The even distribution of nearly all the British forms of *Lagena* on both the Northumberland and Durham coasts is a striking fact established by the results of these dredgings, and not less remarkable is the great abundance in certain limited areas of some peculiar species. We may instance the extraordinary number of specimens of *Vaginalina linearis*, Mont., found in Berwick Bay,

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and the prevalence of *Polymorphina tubulosa*, D'Orb., at a few spots on the Northumberland coast.

The following is the list of the species taken in the various excursions:—

Sub-kingdom, PROTOZOA.

Class, RHIZOPODA.

Order, RETICULARIA.

(FORAMINIFERA.)

	1862.		1863.		1864.	
	Northumberland.	Dogger Bank.	Northumberland.	Durham.	Northumberland.	Durham.
Cornuspira, *Schultze.*						
foliacea, *Phillippi*	..	..	..	*	*	..
Biloculina, *D'Orb.*						
ringens, *Lamk.*.....	*	*	..	..	..	..
elongata, *D'Orb.*	*	..	..	*	*	..
depressa, *D'Orb.*	*	*	..	*	*	*
Spiroloculina, *D'Orb.*						
limbata, *D'Orb.*	*	..	..	*	*	..
planulata, *Lamk.*	..	..	*	*	..	..
excavata, *D'Orb.*	..	..	..	*	*	..
Triloculina, *D'Orb.*						
trigonula, *Lamk.*	*	*	*	*	*	..
oblonga, *Montagu*.....	..	..	*	..	*	..
Quinqueloculina, *D'Orb.*						
seminulum, *Linn.*	*	*	*	*	*	*
bicornis, *W. & J.*.....	*	..	*	*	*	..
secans, *D'Orb.*	..	..	..	..	*	..
Ferussacii, *D'Orb.*	*	..	..	..	..	..
Lituola, *Lamk.*						
scorpiurus, *Montfort* ..	..	..	..	*	*	*
Canariensis, *D'Orb.*....	*	..	*	*	..	*
Valvulina, *D'Orb.*						
Austriaca, *D'Orb.*.....	..	..	..	..	*	*
Lagena, *Walker.*						
sulcata, *W. & J.*	*	*	*	*	*	*
lævis, *Montagu*.....	*	*	*	*	*	*
striata, *Montagu*	*	*	*	*	*	*
semistriata, *Will.*.....	..	.	..	*	*	*
globosa, *Montagu*.....	*	*	..	..	..	..
marginata, *Montagu*....	*	*	*	*	..	*
squamosa, *Montagu*	*	*	*	*	*	*
melo, *D'Orb.*.....	*	..	..	*	..	..
caudata, *D'Orb.*	..	..	*	..	..	*
distoma, *P. & J.**.....	..	..	..	*	*	*

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	1862.		1863.		1864.	
	Northumberland.	Dogger Bank.	Northumberland.	Durham.	Northumberland.	Durham.
Nodosaria, *Lamk.*						
longicauda, *D'Orb.*	*	*	..	*	*	..
pyrula, *D'Orb.*	*	..	..	*	*	..
Dentalina, *D'Orb.*						
communis, *D'Orb.*	*	*	..	*	*	..
Vaginulina, *D'Orb.*						
legumen, *Linn.*	*	..	..	..	*	..
linearis, *Montagu*	*	..	..	..	*	..
Cristellaria, *Lamk.*						
rotulata, *Lamk.*	*	..	..	..	*	..
crepidula, *F. & M.*	..	..	*	..	.	..
Polymorphina, *D'Orb.*						
lactea, *W. & J.*	*	*	*	*	*	*
compressa, *D'Orb.*	*	..	..	*	*	*
tubulosa, *D'Orb.*	*	*	..	..	*	*
Uvigerina, *D'Orb.*						
angulosa, *Will.*	..	..	..	*	..	*
irregularis, *nov. spec.* ..	..	..	..	..	*	..
Orbulina, *D'Orb.*						
universa, *D'Orb.*	*	..	..	*	..	..
Globigerina, *D'Orb.*						
bulloides, *D'Orb.*	..	*	..	*	..	..
Textularia, *Defrance.*						
variabilis, *Will.*	*	..	..	..	..	..
pygmæa, *D'Orb.*	..	*	..	..	..	..
sagittula, *Defrance*	*	*	*	..	*	..
trochus, *D'Orb.*	*	..	..	..	..	..
complexa, *nov. spec.*	*	..	..	..	..	..
Bigenerina, *D'Orb.*						
digitata, *D'Orb.*	..	..	..	..	..	*
Verneuilina, *D'Orb.*						
polystropha, *Reuss.*	..	..	..	..	*	..
Bulimina, *D'Orb.*						
pupoides, *D'Orb.*	*	*	..	*	*	*
marginata, *D'Orb.*	*	..	..	*	*	*
aculeata, *D'Orb.*	..	..	..	*	..	*
ovata, *D'Orb.*	*	..	..	*	*	*
elegantissima, *D'Orb.* ..	*	..	..	..	..	..
Virgulina, *D'Orb.*						
Schreibersii, *Czjzek.*	*	..	..	..	..	..
Bolivina, *D'Orb.*						
punctata, *D'Orb.*	..	..	..	..	*	..
Cassidulina, *D'Orb.*						
lævigata, *D'Orb.*	..	..	*	..	*	..
crassa, *D'Orb.*	*	..	..	..	..	..
Discorbina, *P. & J.*						
globularis, *D'Orb.*	*	..	*	*	*	*
rosacea, *D'Orb.*	..	..	*	*	*	*
Planorbulina, *D'Orb.*						
Mediterranensis, *D'Orb.*	*	*	*	*	*	*

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	1862.		1863.		1864.	
	Northumberland.	Dogger Bank.	Northumberland.	Durham.	Northumberland.	Durham.
Truncatulina, *D'Orb.*						
lobatula, *Walker*	*	..	*	*	*	*
refulgens, *Montfort*	..	..	..	..	*	..
Rotalia, *Lamk.*						
Beccarii, *Linn.*.....	*	*	..	*	*	*
nitida, *Will.*.....	..	..	..	..	*	..
Patellina, *Will.*						
corrugata, *Will.*	*	..	..	..	*	..
Polystomella, *Lamk.*						
crispa, *Linn.*.....	*	*	*	..	..	..
striato-punctata, *F. & M.*	*	..	..	*	*	*
Nonionina, *D'Orb.*						
turgida, *Will.*	*	..	..	..	*	..
umbilicatula, *Montagu*..	..	..	..	*	..	..
depressula, *W. & J.*....	*	..	*	*	..	*
scapha, *F. & M.*	..	..	..	*	..	..

TABULAR SUMMARY OF THE FOREGOING REPORTS.

The following table shows the results of the three years' dredging in the number of new and locally new species obtained, from which it appears that the number of species in all classes thus added to our local Fauna is 106, of which 30 are new to science, and 19 are now for the first time recorded as inhabitants of Britain. The Foraminifera had previously to these dredgings received so little attention, that almost all the species may be called new to the district.

	Total Number of Species obtained.	New to Science.	New to Britain.	New to this District.
Cephalopoda.....	2	.....	.....	1
Gasteropoda.....	84	.....	1	4
Lamellibranchiata	65	.....	.....	.....
Tunicata	13	.....	.....	1
Podophthalma.....	44	4	.....	9
Amphipoda	53	5	1	24
Isopoda	8	1	.....	1
Entomostraca	34	9	7	5
Cirripedia	9	4	2	2
Pycnogonoidea.....	10	2	3	.....
Crinoidea	1	.....	.....	.....
Asteroidea.....	18	.....	1	.....
Echinoidea	10	1	.....	2
Holothuroidea.....	9	1	.....	1
Polyzoa	53	.....	1	4
Hydrozoa	57	1	.....	3
Actinozoa	10	.....	.....	.....
Foraminifera	70	2	3	.....

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EXPLANATION OF PLATES.

PLATE I.

CALANUS CLAUSII, *G. S. Brady.*

Fig. 1. Calanus Clausii, × 40.
Fig. 2. Superior antenna of female, × 85.
Fig. 3. „ „ male, × 85.
Fig. 4. Inferior antenna, × 120.
Fig. 5. Lower foot-jaw, × 120.
Fig. 6. Foot of fourth pair, × 120.
Fig. 7. Left foot of fifth pair (male), × 120.
Fig. 8. Right „ „ „ × 120.
Fig. 9. Abdomen of female (first two segments) with spermatophore attached, × 85.
Fig. 10. Abdomen of male, × 85.
Fig. 11. Fifth pair of feet of the immature male, × 210.
Fig. 12. Cetochilus septentrionalis, terminal spines of fourth swimming foot, × 210.
Fig. 13. Calanus Clausii, „ „ × 210.
Fig. 14. Dias longiremis, „ „ × 250.
Fig. 15. Temora Finmarchica, „ „ × 210.
Fig. 16. „ velox, „ „ × 210.
Fig. 17. Ichthyophorba hamata, „ „ × 210.
Fig. 18. Anomalocera Patersonii, „ „ × 210.
Fig. 19. Pontellina brevicornis, „ „ × 210.

PLATE II.

TEMORA FINMARCHICA, *Gunner.*

Fig. 1. Male animal, × 40.
Fig. 2. Right antenna of male, × 85.
Fig. 3. Superior antenna of female, × 85.
Fig. 4. Inferior antenna, × 85.
Fig. 5. Third foot-jaw, × 85.
Fig. 6. Foot of fourth pair, × 85.
Fig. 7. Caudal segments, × 85.
Fig. 8. Left fifth foot of male, × 85.
Fig. 9. Right „ „ × 85.
Fig. 10. Fifth foot of female, × 210.

DIAS LONGIREMIS, *Lilljeborg.*

Fig. 11. Left superior antenna of male, × 100.
Fig. 12. Right „ „ „ × 70.

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Fig. 13. Superior antenna of female, × 100.
Fig. 14. Inferior antenna, × 120.
Fig. 15. Foot of fourth pair, × 120.
Fig. 16. Abdomen and tail setæ, × 85.
Fig. 17. Fifth foot of female, × 210.
Fig. 18. Fifth pair of feet of male, × 210.

PLATE III.

TEMORA VELOX, *Lilljeborg*.

Fig. 1. Male animal, × 50.
Fig. 2. Right superior antenna of male, × 85.
Fig. 3. Superior antenna of female, × 85.
Fig. 4. Inferior antenna, × 120.
Fig. 5. Mandible, × 120.
Fig. 6. Lower foot-jaw, × 210.
Fig. 7. Foot of first pair, × 120.
Fig. 8. Foot of fourth pair, × 120.
Fig. 9. Foot of fifth pair, × 120.
Fig. 10. Fifth pair of feet of male, × 210.
Fig. 11. Abdomen, × 85.

PLATE IV.

ICHTHYOPHORBA DENTICORNIS, *Claus*.

Fig. 1. Male animal, dorsal view, × 40.
Fig. 2. Right superior antenna of male, × 85.
Fig. 3. Extremity of left superior antenna of male, × 85.
Fig. 4. Inferior antenna, × 85.
Fig. 5. Right fifth foot of male, × 50.
Fig. 6. Foot of fifth pair of female, × 85.

ICHTHYOPHORBA HAMATA, *Lilljeborg*.

Fig. 7. Right superior antenna of male, × 85.
Fig. 8. Lower foot-jaw, × 85.
Fig. 9. Foot of first pair, × 85.
Fig. 10. Right fifth foot of male, × 85.

CETOCHILUS SEPTENTRIONALIS, *Goodsir*.

Fig. 11. Extremity of superior antenna (after Claus).
Fig. 12. Basal joints of fifth pair of feet (after Claus).

PLEOPIS POLYPHEMOIDES, *Leuckart*.

Fig. 13. Lateral view of animal, × 60.

PLATE V.

Fig. 1. Cythere simplex, *Norman*; right valve, × 40.
Fig. 2. ,, ,, ,, seen from above, × 40.

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Fig. 3. Cythere simplex, *Norman;* seen from below, × 40.
Fig. 4. „ „ „ end view, × 40.
Fig. 5. Cythere Bradii, *Norman;* left valve, × 40.
Fig. 6. „ „ „ seen from above, × 40.
Fig. 7. „ „ „ seen from below, × 40.
Fig. 8. „ „ „ end view, × 40.
Fig. 9. Cythere declivis, *Norman;* left valve, × 40.
Fig. 10. „ „ „ seen from above, × 40.
Fig. 11. „ „ „ seen from below, × 40.
Fig. 12. „ „ „ end view, × 40.
Fig. 13. Cythere lævata, *Norman;* left valve, × 40.
Fig. 14. „ „ „ seen from above, × 40.
Fig. 15. „ „ „ seen from below, × 40.
Fig. 16. „ „ „ end view, × 40.
Fig. 17. Cythere cellulosa, *Norman;* left valve, × 40.
Fig. 18. „ „ „ seen from above, × 40.
Fig. 19. „ „ „ seen from below, × 40.
Fig. 20. „ „ „ end view, × 40.

PLATE VI.

Fig. 1. Cythereis limicola, *Norman;* left valve, × 50.
Fig. 2. „ „ „ seen from above, × 50.
Fig. 3. „ „ „ seen from below, × 50.
Fig. 4. „ „ „ end view, × 50.
Fig. 5. Cythere latissima, *Norman;* right valve, × 50.
Fig. 6. „ „ „ seen from above, × 50.
Fig. 7. „ „ „ seen from below, × 50.
Fig. 8. „ „ „ end view, × 50.
Fig. 9. Cythere guttata, *Norman;* left valve, × 50.
Fig. 10. „ „ „ seen from above, × 50.
Fig. 11. „ „ „ seen from below, × 50.
Fig. 12. „ „ „ end view, × 50.
Fig. 13. Cythere multifora, *Norman;* left valve, × 50.
Fig. 14. „ „ „ seen from above, × 50.
Fig. 15. „ „ „ seen from below, × 50.
Fig. 16. „ „ „ end view, × 50.
Fig. 17. Cythere cellulosa, *Norman;* left valve, × 85.

PLATE VII.

Fig. 1. Cythereis Dunelmensis, *Norman;* left valve, × 40.
Fig. 2. „ „ „ seen from above, × 40.
Fig. 3. „ „ „ seen from below, × 40.
Fig. 4. „ „ „ end view, × 40.

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Fig. 5. Cythereis Jonesii, *Baird;* right valve, × 40.
Fig. 6. „ „ „ seen from above, × 40.
Fig. 7. „ „ „ seen from below, × 40.
Fig. 8. „ „ „ end view, × 40.
Fig. 9. Unciola planipes, *Norman;* first gnathopod, seen from one side, × 40.
Fig. 10. „ „ „ first gnathopod, seen obliquely from above. × 40.
Fig. 11. „ „ „ second gnathopod, × 40.
Fig. 12. „ „ „ pleon, seen from above, showing telson and uropods, × 40.
Fig. 13. „ „ „ last uropod, × 40.
Fig. 14. Cheirocratus mantis, *Norman;* first gnathopod, × 16.
Fig. 15. „ „ „ second gnathopod, × 16.

PLATE X.

Fig. 1. Nymphon rubrum, *Hodge.*
Fig. 2. Thyone flexus, *Hodge;* slightly enlarged.
Figs. 3-9. „ „ body spicules viewed flat and sideways.
Figs. 10, 11. „ „ body spicules in course of formation.
Figs. 12, 13. „ „ foot spicules (from sides of foot).
Fig. 14. „ „ terminal plate of foot (or sucking disc).
(Figures 3–14 magnified 200 diameters.)

II — *On Cyanea imporcata, an undescribed Medusa taken off the Northumberland Coast.* By the Rev. Alfred Merle Norman, M.A. (Plate XI.)

During the first dredging expedition, undertaken under the auspices of the British Association, in 1862, a very fine and strikingly beautiful Medusa was taken between seventy and eighty miles off Tynemouth, as the steamer was returning from the Dogger Bank. As far as I can ascertain it would seem to be an undescribed species, and referable to the genus *Cyanea*, though the tentacles remained very short during the time it was kept alive in a bucket of water, and showed no signs of the extreme extensibility which is generally so marked a feature in this genus. Mr. Tuffen West, who was one of the party on board, made the

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drawing from the living animal, from which the plate which illustrates this paper has now been engraved, and the notes which form the basis of the following description were at the same time taken by myself.

Class. HYDROZOA.

Order. DISCOPHORÆ. *Agassiz.*

Fam. CYANEIDÆ. *Agassiz.*

Genus. CYANEA, *Peron.*

Cyanea imporcata, n. sp. Pl. XI.

The hydrosoma is inverted cup-shaped, moderately convex, about four and a half inches in diameter, tinged with deeper and paler shades of indigo blue, the colour being disposed as will be presently described. The margin is divided into eight principal lobes, each of which is again subdivided into four lesser lobes, so that the whole circumference of the hydrosoma is festooned in thirty-two lobes. The disk is elevated into sixteen radiating ridges, with as many intermediate furrows. A radiating canal (?) of an intenser blue than the rest of the hydrosoma passes down the centre of each of the ridges, and gives forth numerous obliquely divaricating secondary canals (?) which pass down the slopes of the ridge on either side towards the furrows. The radiating ribs and their canals terminate at the margin in the greater sinuses and in the central sinuses of the greater lobes. Each furrow on the other hand is traversed by a white line and terminates in a lateral sinus of the greater lobes. The obliquely divaricating transverse branches which proceed from the blue and elevated canals and pass down the slopes of the ridges to near the base of the furrows are likewise to be recognized by the deeper tint of blue which marks their course.

There are no tentacles on the margin, but, situated on the under surface of the hydrosoma, at a short distance within the margin of each of the principal sinuses, there is seen a semicircle of about forty crowded, simple tentacles, of a yellow colour. These tentacles are so short, that they scarcely appear below the

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margin of the disk. The horns of the semicircle of tentacles point outwards.

The lithocysts are eight in number, one of which is situated a short distance within the margin of each of the central sinuses of the greater lobes.

The oral appendages are greatly developed and assume the form of four large many-folded ochreous yellow curtains, exquisitely margined with a short and finely cut fringe. The length of the curtains is somewhat greater than their united breadth, as they hang suspended beneath the hydrosoma.

The ovaries are dull reddish brown.

The *Cyanea* here described is preserved in fluid in the Museum of the Natural History Society of Northumberland, Durham, and Newcastle-on-Tyne.

III.—*Descriptions of three new or imperfectly known Polyzoa, found on the Coasts of Northumberland and Durham.* By Joshua Alder. (Plate VIII.)

The descriptions of the following species of Polyzoa are extracted from a paper read at the meeting of the British Association in Newcastle, and afterwards published in the "Journal of Microscopical Science." They have been considered of sufficient local interest to admit of their introduction here.

Fam. ESCHARIDÆ, *Busk.*

Eschara Landsborovii, *Johnston.* Pl. VIII, figs. 1–3.

Polyzoary consisting of very thin and delicate foliaceous plates, anastomosing irregularly, and undulating on the upper margin, which is a little expanded. *Cells* in longitudinal rows, placed alternately or in quincunx. They are oblong, thin, and perforated with large punctures. *Apertures* with the margin slightly raised, nearly circular above, and produced into a point below, where there is a small, slightly prominent, circular avicularium,

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behind which is a truncated denticle. *Ovicells* prominent, globose, or ovate, silvery and perforated, produced below into a raised margin surrounding the mouth of the cell, and giving it a triangular form. A rather large, spatulate avicularium is seen in some cells, placed transversely by the side of an ovicell, and raised a little from the surface (fig. 3). The two layers of cells are separable. Height two inches; breadth about two and a half inches.

Lepralia Landsborovii, Johns., Brit. Zooph., p. 310, T. 54, fig. 9; Busk, Catal., p. 66, T. 86, fig. 1, and T. 102, fig. 1; Hincks, in Jour. Micros. Sc., Vol. VIII, p. 277 (young state).

Eschara foliacea, Alder, in Trans. Tynes. Club, Vol. III, p. 151.

This delicate and fragile species was obtained some time ago on the north coast of Northumberland, by Mr. Embleton, of Beadnel Cottage, but was passed over at the time of the publication of my "Catalogue of the Zoophytes of Northumberland and Durham," as a variety of E. foliacea. A second and more careful examination, however, convinced me that it was a distinct and very characteristic species, hitherto undescribed as an Eschara, but not entirely unknown to science, as the L. Landsborovii of Johnston turns out to be an encrusting form of this species, which has not until now been seen in its perfect state. Mr. Bean, however, has lately sent me a small specimen for examination, got at Scarborough, in which a double layer of cells rises to about an inch in height; and Mr. Norman has dredged a variety of this species in Guernsey, consisting of a single layer, assuming the form of a hollow cylinder, with the edges slightly appressed at their junction. Mr. Hincks has also met with similar examples. It is rather singular that on this coast, where for the first time the species has been found in its perfect state, the Lepralian or rudimentary form is unknown. In its intermediate state this species has all the characters of the genus Hemeschara of Busk. At present, I am inclined to consider that genus as only a

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peculiar state of an Eschara, and which some species have more tendency to assume than others.

E. Landsborovii differs from most of the other members of the genus, in having the two layers of cells readily separable—a character that has been considered generic by some authors, but which does not appear to be of any great importance.

Mr. Embleton has kindly presented his unique specimen to the Newcastle Museum.

ESCHARA PAVONELLA, *Alder.*

Polyzoary foliaceous, yellowish, forming continuous flaleliform or undulating expansions, arising from an encrusting or clasping base. *Cells* oval or oblong, with large perforations generally radiating from the centre to the circumference. *Apertures* orbicular, large, with a thin plain margin, and a small mucro below, having a flattened and truncated apex. An oval avicularium on each side of the mouth. No ovicells have been observed. Height about an inch and a half; breadth variable, but generally exceeding the height.

E. cribraria, Busk, in Jour. Micros. Sc., vol. IV, p. 311, T. 10, figs. 7, 9.

Excellent figures of this beautiful species were given by Mr. Busk in the "Microscopical Journal," from specimens I had the pleasure of sending him from Newcastle a few years ago. That gentleman then considered it to be the *E. cribraria* of Johnston, an opinion which now proves to be erroneous. I was first led to this conclusion from observing that Dr. Johnston mentions, in his account of E. cribraria,* having had a fragment of another native species sent him from Scarborough by Mr. Bean, but too imperfect for description in so difficult a genus. Mr. Bean has favoured me with a sight of this fragment, which proves to belong to the present species, and which Dr. Johnston therefore evidently considered distinct from his E. cribraria. An examination of Dr. Johnston's specimen of the latter species in the British Museum, lately made for me by Mr. Norman, confirms this opinion, and

* "British Zoophytes," 2nd Ed., p. 353.

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makes it necessary to give another name to the species now under consideration.

E. pavonella, like the foregoing species, is sometimes found assuming all the three forms of a Lepralia, a Hemeschara, and an Eschara, according to the substance on which it is developed, often clasping the stems of zoophytes in a single layer before rising into a double foliaceous expansion. It is a deep-water species, only yet found on the north-east coast of England, ranging from Cullercoats to Scarborough, and extending eastward to the Dogger Bank.

The specimens from which Professor Busk's larger figures were taken are in the Newcastle Museum.

Fam. CELLULARIADÆ, *Busk.*

Scrupocellaria Delilii, *Audouin.* Pl. VIII, figs. 4–8.

Polyzoary slender, shining, dichotomously branched, conspicuously jointed, the internodes containing from five to ten cells each. *Cells* ovate, narrowed below; apertures oval, with smooth margins, bearing one stout spine (or sometimes two) on the upper and outer margins, and a smaller one on the inner margin. *Operculum* ovate, channelled with tubes, forming a lobated cavity. Marginal avicularia moderately prominent: there is also a tubular or conical avicularium in the centre, in front of each cell. Vibracular capsules (sinus of Busk) transversely wedge-shaped, stretching across the back of a cell and part of the adjoining one. *Vibracula* short, rising from the upper and outer angle of the capsule, below which is an aperture for one of the radical fibres, which are numerous, and scattered over the whole of the branches. *Ovicells* small, smooth, and imperforate. Height half an inch.

Crisia Delilii, Aud., in Savigny's "Egypt" (fide Busk).

Cellularia scrupea, Alder, in Trans. Tynes. Club, vol. III, p. 148.

Scrupocellaria Delilii, Busk, in Jour. Micros. Sc., vol. VII, p. 65, T. 22, figs. 1, 2, 3.

I obtained specimens of this delicate little Scrupocellaria a few

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years ago, from the deep-water fishing-boats on the Northumberland coast, but did not at the time observe its distinctness from S. scrupea, with which it agrees in having the cells operculated. It differs, however, in having an avicularium on the front of each cell, and in the peculiar shape of the vibracular capsule, which is transversely wedge-shaped, while in the other known species it is bilobed and erect. Another example of this species has lately been dredged on the Durham coast, by Mr. G. S. Brady and Mr. Hodge. It appears to be a Mediterranean species, and has also been found in Madeira by Mr. J. Y. Johnson. This is the first notice of its occurrence on the British coast.

EXPLANATION OF PLATE VIII.

Fig. 1. Eschara Landsborovii, natural size, from Mr. Embleton's specimen in the Newcastle Museum.
Fig. 2. A portion of the same, highly magnified.
Fig. 3. A cell of the same, with ovicell and avicularium more highly magnified.
Fig. 4. Scrupocellaria Delilii, natural size.
Fig. 5. A portion of the same, magnified, front view.
Fig. 6. Back view of the same.
Fig. 7. A cell of the same, with ovicell, magnified.
Fig. 8. A central avicularium, magnified.

IV.—*On some Remains of Fish and Plants from the "Upper Limestone" of the Permian Series of Durham.* By JAMES W. KIRKBY.* (Plate IX.)

THE object of the present paper is to record the discovery of fish-remains in the Upper Magnesian Limestone of the Permian formation, the occurrence of these fossils in that subdivision being of interest in several respects, though more especially so on account of their having there been found at an horizon considerably

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higher in the Permian series than any vertebrate remains had previously occurred.*

The fossils were first noticed by the workmen in August, 1861, in a newly opened quarry belonging to Sir Hedworth Williamson, Bart., at Fulwell, about a mile and a half to the north of Sunderland; and my attention was almost immediately drawn to them by Mr. Henry Abbs, of the latter town. From that period, almost up to the present time, though chiefly during the autumn and winter of 1861, and the spring and summer of 1862, I have continued to collect specimens, and to pursue inquiries as to their palæontological and geological relations. In these researches I was joined by several scientific friends, who courteously allow me to use the results of their labours along with those of my own in this account of the fossils. Among these friends I ought specially to mention Mr. A. W. Dixon and Mr. W. M. Wake, of Sunderland, and Mr. R. Howse, of South Shields. I should also remark, that I am considerably indebted to the lessee of the quarry, Sir H. Williamson, with whose permission my inquiries were made; and I also owe much to the active assistance and careful observation of the overman, Mr. T. Foster.

The quarry referred to is situated on the northern slope of Fulwell Hill, and is not far distant from another more extensive and much older quarry belonging to the same proprietor. In these quarries, as well as in others on the same hill, more to the west, the Magnesian Limestone is largely worked for lime-burning, as it has been in the older quarries for the last sixty years or more. During the whole of that period, up to 1861, no traces of any organic remains had ever been found in the limestone of this hill. But about the time named, or a little before, it became necessary, in order to keep the new quarry at its proper level, to cut through some underlying beds (brought up by an anticlinal), which had never yet been quarried on account of the unvendible quality of

* Both Professor King and Mr. Howse allude to the discovery of fossil fish in Marsden Bay, though neither mention in which member of the series the discovery was made. I have lately however become aware that the specimens to which these distinguished palæontologists refer, were found—the one by Miss Green, of South Shields, and the other by Mr. Fryer, of Whitley—in the Upper Limestone, from about the same horizon at which I met the imperfect specimen noticed at page 66.

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the limestone; and it was in working these lower and inferior strata that the great bulk of the fossil fish were discovered, most of them having been found in one bed, or zone of beds, of limestone; there, nevertheless, being several instances of their occurrence both above and below that horizon.

Soon after their discovery in the new quarry, another or the same anticlinal brought up the equivalent strata in the old quarry, about half a furlong to the south; and it was not long before the same fossils were met with there, besides other species that the first locality had not yielded.

The same fish-bed would appear also to extend considerably to the north-east; for I have obtained the tail-half of a small fish from a stratum of limestone in Marsden Bay, occupying the same stratigraphical position as the Fulwell Fish-bed.*

The Magnesian Limestone worked in the Fulwell quarries belongs to the higher portion of the Permian series, or, to speak with precision, to the "Upper Limestone" of the classification proposed by Mr. Howse, or to the Crystalline and Concretionary Limestone of Professor King's arrangement. But it must be further observed that the Upper Limestone of Durham is composed of two portions, the higher being yellow, friable, or compact, or oolitic, and thin-bedded, while the lower is of various shades of yellow and grey, highly concretionary, compact, or friable, and thick-bedded. It is the latter portion that is worked in the quarries of Fulwell Hill, that district being situate beyond the outcrop of the higher strata. The lower portion, which, for the sake of convenience, I shall term the Fulwell beds, has been further subdivided by the quarrymen into several minor groups. These it will be well to mention, as they serve to mark with greater exactness the vertical distribution of the fossils to be described.

Below the higher thin-bedded yellow limestone is a series of thick beds of hard, subcrystalline, grey or whitish grey limestone,

* It is possible that the fish-bed may extend to the south as well as to the north of Fulwell. Strata equivalent in position to it are occasionally exposed in excavating cellars and foundations in Bridge Street, and thence a few hundred yards down High Street, in Bishopwearmouth. They also occur in the form of a finely laminated, light yellow limestone, between tide marks, opposite the Craggs, near Ryhope Half-way House.

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associated with or passing into strata of conglobated or botryoidal and very friable white limestone; this group is the "White Stone" of the Fulwell quarrymen. Immediately below is about three feet of dark grey, highly crystalline, and conglobated limestone, with beautiful (metastatic) crystals of calc-spar, and crystalloids of limestone; this is named the "Black Shell." Underlying it is generally a bed of soft friable limestone with conglobations; and then follows from twenty to twenty-five feet of thick-bedded crystalline and concretionary limestone, which, from its peculiar structure, is termed the "Honeycomb Limestone or Main Stone." Separated from the Main Stone by about two feet of conglobated limestone, follows nine feet of white or yellowish, very soft and friable limestone, which is the great "Marl Bed" of the quarrymen. Under it is about nine feet of thinner-bedded, often laminated, compact, yellow or brown limestone, called the "Dun Stone." This is underlaid by eight feet of highly concretionary and crystalline, coralloidal, and laminated limestone, designated the "Grey Stone." Immediately under this is two feet of laminated limestone, which I have already noticed as having yielded most of the fish-remains; on this account I propose to call it the Fulwell Fish-bed. About eight feet of limestone underlies the fish-bed, the upper portion being concretionary and laminated, and the lower laminated and argillaceous, the most inferior stratum passing into a bed of yellow-brown and white, laminated marl and clay, one foot thick. The laminated marl rests upon the *Middle Limestone*, which at Fulwell assumes its pseudobrecciated phase, being light-coloured, friable with hard cherty concretions, unstratified, and unfossiliferous.

The accompanying section (fig. 1) of the Fulwell limestone will, perhaps, render this account easier of comprehension; and the sequence of strata indicated may be seen, either wholly or in part, in the various quarries at Fulwell Hill, but more particularly in the old quarry of Sir H. Williamson. The basal beds of the *Upper Limestone*, and their junction with the *Middle Limestone*, are well exposed in the cutting on the North-Eastern Railway, at Fulwell.

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Fig. 1.—*Vertical Section of the Magnesian Limestone of Fulwell Hill.*

Scale 15 feet to the inch.

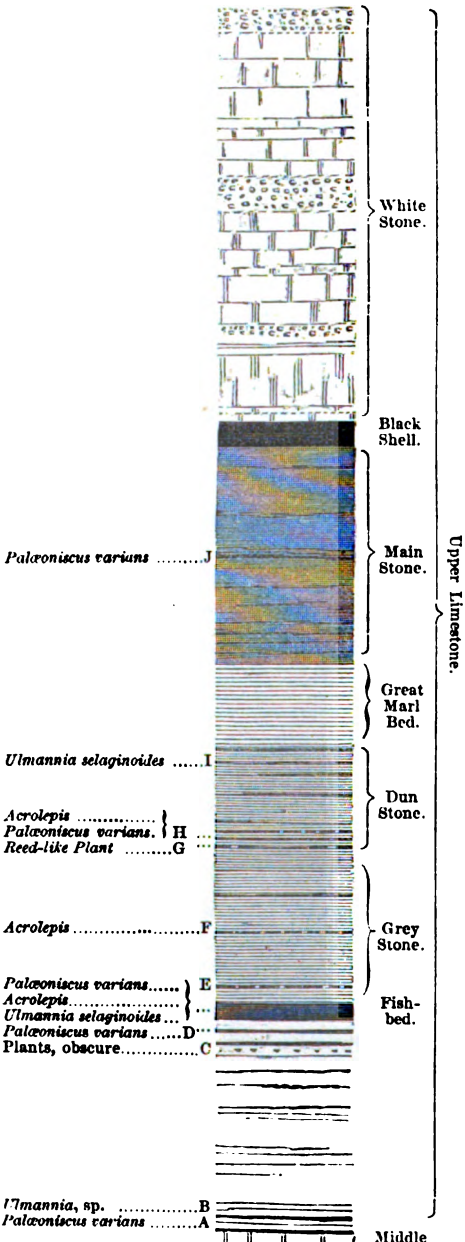
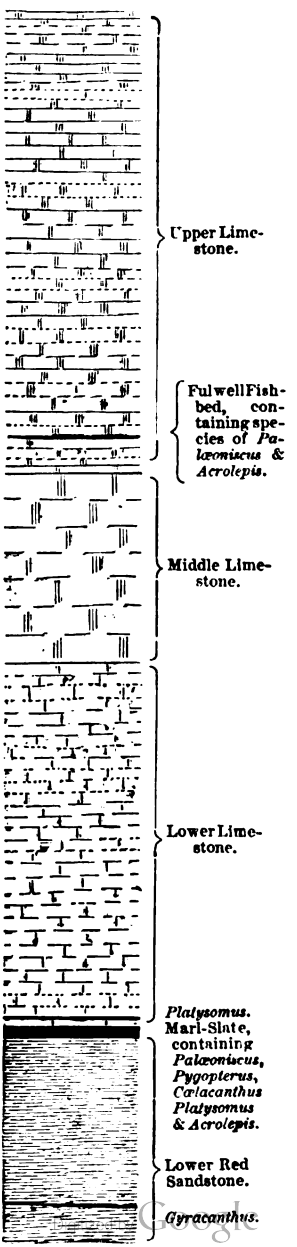


Fig 2.—*Vertical Section of the Permian Strata of Durham.*

Scale 100 feet to the inch.



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The limestone of the fish-bed in the new quarry, Fulwell, though difficult to describe in precise terms, on account of its liability to structural changes, is almost invariably laminated or slaty, the laminæ usually showing repeated alternations of crystalline, earthy, and compact textures. The crystalline laminæ are generally grey or brown in colour, and the earthy and compact laminæ of various shades of yellow. A band of soft and rather friable light yellow limestone runs through the centre of the bed. In some places the limestone of this bed becomes generally more highly crystalline and somewhat concretionary in character; when this occurs, the plane surfaces are rough and more or less irregular. Otherwise the surfaces of the laminæ are usually smooth, forming a fine matrix for the fossils they enclose.

In the old quarry the bed decreases somewhat in thickness, is not so regularly laminated, and is softer and more earthy than in the new quarry.

At Marsden, the limestone which has yielded me fish-remains is soft, yellow, and finely laminated, being, in fact, the well-known "flexible limestone" of geologists.

In the fish-bed of the new quarry, and wherever else these fossils occur, the specimens almost invariably appear to have belonged to perfect individuals, or, at least, the dermoskeleton, fins, and bones of the head have been unimpaired up to the period of deposition, though instances of distortion by subsequent compression are not unfrequent. The specimens are found on the surfaces of the laminæ, usually slightly in relief. They almost invariably retain the finely enamelled surface of the original ganoine, and are of a brown colour. Most of the examples found present a lateral view, with the dorsal, anal, and caudal fins outspread, and with the trunk uncontorted; examples with the trunk bent upon itself, or what is usually termed contorted, are comparatively rare. Individuals showing the dorsal and ventral aspects occasionally occur. Besides the scales, cephalic bones, and fin-rays, the interspinous bones of the fines are sometimes preserved; and very rarely traces of the vertebral processes. The specimens are sparingly distributed in the bed, occurring generally as isolated individuals; still, a pair of individuals, and

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sometimes more, are occasionally found together on a plane surface of a few square feet. Such instances, however, are exceptional; and, notwithstanding that probably some hundreds of specimens have been found since their first discovery, they cannot be described as common, the quantity of specimens obtained being due rather to assiduous research than to their own abundance.

Fully nine-tenths of the specimens found belong to a single species of *Palæoniscus*. The remainder belong to two or probably three species of the same genus, and to a species of *Acrolepis*. All the *Palæonisci* are small, the largest of the forms being but little more than four inches in length. The *Acrolepis* seems to have attained a length of twelve inches.

Associated with the fish-remains, there have also rarely occurred some fragments of plants. These, though very imperfectly preserved, appear to be referable to three species, one of which is a *Calamites*, two *Ulmanniæ*, and the fourth is a large reed-like form, the generic relations of which are difficult to determine from the discovered fragments. These are the only fossils that have been met with along with the fish. No traces of Mollusca occur with them, nor, as yet, of Entomostraca or other microzoa, though several representatives of these classes are pretty commonly distributed in other parts of the Upper Limestone.

It has already been remarked that the fossils are not altogether confined to the stratum designated the fish-bed; they are comparatively most abundant in that zone, and it is almost only there where there is a probability of finding them by personal search, their occurrence on other horizons being so rare as nearly always to be the result of accidental observation rather than the reward of direct investigation. Still, as they do occur at other horizons, it is important that we should place on record all that is known of their vertical range.

Commencing from below, the fossils first appear in the soft laminated marls at the base of the Upper Limestone, at the point marked A in fig. 1; from this horizon two imperfectly preserved examples of the common form, *Palæoniscus varians*, have been obtained. In the slaty argillaceous limestone immediately overlying the last-named bed, and marked B in the section, a single

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specimen of *Ulmannia*, sp. indet., has been met with; and in the soft yellow limestone, marked C in the section, about five or six feet higher in the series, several obscure fragments of vegetables have occurred. In the concretionary and lamino-concretionary beds marked D, lying between the last-named stratum and the fish-bed, several imperfect specimens of *P. varians* have been observed, and more particularly on the uppermost surface-plane on which the fish-bed rests, where, besides *P. varians*, there have occurred specimens of *Acrolepis*. In the fish-bed proper have been obtained the four *Palæonisci*, namely, *P. varians*, *P. altus*, *P. Abbsii*, and *P. angustus?* the *Acrolepis*, and *Calamites arenaceus?* and *Ulmannia selaginoides*. In the laminated beds overlying the fish-bed, and marked E in the section, *Acrolepis* has occurred, as it has also in the upper part of the grey stone about the horizon marked F. At or about the level marked G was also found the large reed-like plant. At certain horizons of the Dun Stone, marked H and I in the section, examples of *Acrolepis*, *Ulmannia*, and *Palæoniscus varians* have occurred in the order indicated in the section. And, lastly, a single badly preserved, though determinable, specimen of *P. varians* in the Main or Honeycomb Limestone, at the point marked J—this being the highest horizon at which traces of fish or any other fossils have as yet been met with at Fulwell. The space between the highest and lowest points of occurrence is about 54 feet; and, according to our present knowledge, that represents the vertical range of this small group of species.

To take a more comprehensive view of the position of these fish-bearing strata in the Permian formation, it may be observed that they are situated about 150 feet from the top of the *Upper Limestone*. In the north of Durham this member is the highest in the series; but in Yorkshire its equivalent subdivision (Brotherton Beds and Red Marls and Gypsum) is overlaid by some marls and red sandstone of no great thickness, which some geologists refer to the Permian formation. Assuming that these latter deposits are thus rightly classified, the fish-bearing beds will not be more than 200 feet, probably less, from the

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Trias.* On the other hand, they are separated from the Coal-measures by the Middle and Lower Limestones, Marl-slate, and Lower Red Sandstone, which represent an aggregate thickness of 460 feet. Previous to their discovery, the highest authenticated horizon on record for the occurrence of fish in the Permian series of Durham was the inferior beds of the Lower Limestone,† which had yielded a single specimen of *Platysomus striatus*—the Marl-slate, however, being their chief and almost only horizon. The discovery of the Fulwell fish has, therefore, carried the Permian Vertebrata from the lower beds of the Durham series high into the upper and near enough to the Trias to give to their occurrence, perhaps, more than usual interest.

DESCRIPTIONS OF THE SPECIES.

Class. PISCES.

Order. GANOIDEI.

Fam. 1. SAUROIDEI.

Acrolepis, sp.

A. Sedgwickii, Ag. Kirkby, Annals of Nat. Hist., 3rd Series, vol. IX, p. 269.

About a dozen, or probably rather more, specimens of an *Acrolepis* have occurred, which may possibly belong to one of the forms of this genus already described from Permian rocks. All the specimens, with one exception, are fragments. The perfect specimen belongs to an individual about ten inches long; but I possess a fragment that has evidently belonged to an individual of a foot or more in length.

The maximum height of the ten-inch specimen is between the pectoral and ventral fins, and measures $1\frac{3}{4}$ inch. The head is

* In some parts of Durham there are more than 200 feet of Permian strata above the Fulwell fish bed, the Upper Limestone being subject to considerable variation in thickness. On the coast of Durham, for instance, between Sunderland and Marsden Bay, the Upper Limestone is over 400 feet in thickness.

† I have now a small undescribed fin-spine of a cartilaginous fish from the Middle Limestone of Tunstall Hill.

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2$\frac{11}{16}$ inches long, or nearly one-third of the length of the body. The anterior portion of the body is of a pretty uniform width, but from the ventral fins to the caudal it gradually attenuates to $\frac{3}{4}$ inch. The tail is strongly heterocercal.

The fins are large. The dorsal is 5 inches from the snout, and, though placed between the anal and ventrals, is partly over the latter; the ventrals are about 4$\frac{1}{2}$ inches from the snout; the anal is 7 inches from the snout. The rays of the ventral fins are stout, and consist of twenty-three or twenty-four rays, which bifurcate twice in the terminal third of their length; their articulations, judging from the scales covering them, are short compared with their width, and irregular, except in the three basal joints, which are uniform in all the rays. The pectoral fins appear to have been similar in size to the ventrals, though numbering probably a few more rays. The anal is scarcely larger than the ventrals; it has thirty or thirty-one rays, not quite so stout as those of the ventrals, and with articulations proportionally longer. The dorsal, from what remains I have seen of it, seems to have been a little longer than the anal, and in both it and the latter the rays branch similarly to those of the ventrals. The caudal is large and deeply forked, each lobe being of nearly equal length; but, as the tail-margin slopes rapidly inwards ventrally, the rays of the ventral lobe are very much longer than those of the dorsal lobe, and they are also much stronger. The rays of the caudal fin are numerous, and similar in character to those of the others. Some of the basal ray-scales have the surface ornamentally furrowed or wrinkled, like the body-scales; in the other fins I have always observed that the ray-scales are smooth. The dorsal and ventral margins of this fin are fringed with fulcral scales, those of the dorsal lobe being longer than those of the ventral. Similar though smaller fulcrals protect the anterior margins of the dorsal, anal, ventrals, and pectorals.

The head is obtuse, and has the orbit placed far forwards; the jaws are powerful, and the gape is very large, being more than one-fifth of the length of the body; both upper and lower jaws are furnished with numerous smooth, conical, pointed teeth, about one-fifteenth of an inch in length; these teeth are somewhat

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irregularly placed, and occasionally slightly bent towards the point, and appear to have a few minute teeth between them. The surface of the lower jaw is covered with a pustulate and wrinkled ornamentation; the surface of the rest of the bones of the head, including the opercular plates, has also a rugulose appearance. In one specimen there appear to be traces of branchiostegal rays.

The scales are small and rhomboidal, varying, however, considerably both in size and form. The dorso-ventral series are arranged in steeply sloping curves. The lateral thoracic scales are much larger than those of the dorsal, ventral, and caudal regions, being three times the size of some of the latter; these scales (lateral thoracic), by their great relative width and greater amount of overlap, appear more rectangular in outline than those of other parts of the body. The scales of the ventral region are much the smallest. These latter, and the scales of the caudal portion of the body are those which, by form and ornament, are the most typical of the genus as established by Agassiz. The scales of the thoracic part of the body articulate by means of long, sharply pointed projections from the superior margin, which fit into sockets or depressions of the reverse and inferior portion of the overlapping scale above, as in *Palæoniscus* and so many other of the Lepidoidei. This system of articulation becomes obsolete towards the caudal extremity. The scales of the thoracic region, especially the ventral ones, overlap each other more than those of the caudal region. All these scales are thick and finely enamelled, and are ornamented with two or more converging furrows, which always terminate within the margin. Besides the scales noticed, there are series of large, oval, pointed, bluntly lanceolate, and lanceolate scales, placed in advance of the dorsal, anal, and each lobe of the caudal fins. These scales, which Agassiz terms the *grosses écailles impaires*, attain the length of one-third of an inch, and number in each series from four to six; and they would appear to pass by gradations into the long pointed fulcral scales or spines that fringe the fins. The surface of these scales is closely covered with a similar ornamentation to the other scales, though more elaborate than it.

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The lateral line is well marked by a series of deeply notched and channeled scales in the dorsal half of the body.

None of the specimens discovered show the slightest traces of the endoskeleton.

In one example we obtain some idea of the food of this fish; for intercalated between the scales of each flank, there may be seen portions of a *Palæoniscus varians*, which undoubtedly represent the remains of an undigested individual that had been captured and swallowed by the *Acrolepis* a short time previous to its death.

I at first identified this species with the *Acrolepis Sedgwickii* of Agassiz; but later comparisons of my specimens with Agassiz's descriptions and figures have shown me that it differs from that species in several particulars that appear of importance: for instance, the anal fin of *A. Sedgwickii* is described as being much greater than the dorsal, whereas, in the present species, the difference between these fins is only slight; the scales would also appear much more regular in size and shape in *A. Sedgwickii* than in the present species; and the former fish would appear to have been twice as large as the latter. I therefore cancel the identification I formerly made.

From *A. asper*, Ag., of the Kupferschiefer, the present species differs more than from *A. Sedgwickii*. But there are four species from the same formation, namely, *A. angustus*, Münster, *A. intermedius*, Münster, *A. giganteus*, Münster, and *A. exsculptus*, Germar, of which I have not been able to see either figures or specimens, that may possibly approach more nearly than those I have just noticed. For these reasons it only seems judicious to refrain from attaching a specific name to the species, it being at least possible that it may ultimately prove to belong to one of these last-mentioned forms.

The present species has occurred in the fish-bed, in the Grey Stone overlying, and in the Dun Stone in the New Quarry at Fulwell; and I have taken a single example from the fish-bed in the Old Quarry of the same place.

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Fam. 2. LEPIDOIDEI.

Palæoniscus varians, *Kirkby*. Pl. IX, fig. 2.
Annals of Nat. Hist., 3rd Series, vol. IX, p. 267.

The maximum length of this fish is from 3¾ to 4 inches. It usually occurs much less, often being only 1¾ inch long. Its maximum breadth is about an inch; but this is a point subject to much variation, the breadth of some specimens being one-third of the entire length, and of others only one-fifth. The body continues of similar width up to the dorsal and ventral fins; it then contracts somewhat rapidly to half the maximum width. The head varies in length from one-third to two-sevenths of the entire length, and its breadth is usually a little less than the greatest width of the body. The tail is moderately but decidedly heterocercal.

The fins are of median size. The pectoral, which is about half an inch long in mature examples, and placed at the junction of the ventral and median thirds of the body, consists of from 18 to 20 slender rays, with one or more short but strong spine-like rays in front. The ventrals are about $\frac{1}{16}$ inch shorter than the pectorals, and placed 1¾ inch from the snout; the rays are also less in number, though stouter, than those of the pectorals. The anal is $2\frac{5}{16}$ inches from the snout; or $\frac{9}{16}$ inch behind the ventrals; it numbers from 8 to 10 jointed rays, which are stronger and longer than those of the ventrals. The dorsal is placed about midway between the ventrals and the anal or two inches from the snout; it is larger than the anal, being ⅝ inch long, and it has from 10 to 12 jointed rays of similar strength to those of the anal. In advance of the longest rays of the anal and dorsal are two or three short, pointed, unarticulated rays; one or two similar rays are placed in front of the ventrals. The first segment of the articulate rays of the anal and dorsal is much longer than the succeeding segments—the succeeding segments being only about as long as wide. Each ray is covered by long unsegmented scales, which usually hide from view the ray-structure. The front margin of each of these fins is protected by sharply pointed, linear fulcral scales. The caudal is of moderate size and slightly forked,

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spreading out gently from a base half as wide as the maximum breadth of the body to fully two-thirds of that breadth; it is formed of 17 or 18 rays, as strong as those of the dorsal and anal, and the rays of the ventral lobe are, of course, the longest. The structure of the rays resembles that of the last-mentioned fins: the first segment is of considerable length, being fully four times as long as those that follow it; the succeeding segments are slightly shorter than the equivalent segments in the anal and dorsal, so as to be wider than long. They appear to bifurcate rarely; and they are covered with longitudinal scales, like those of the fins just mentioned. Each lobe is protected along its dorsal and ventral borders with comparatively large fulcral scales. The rays of the caudal, at least those of the central and ventral portions of it, are affixed to long interspinous bones, two rays being attached to each. The rays of the anal and dorsal fins are also attached to interspinous bones, there being in these instances, however, an ossicle to support each ray.

In well-preserved examples, the head is seen to be bluntly cone-shaped. The gape is comparatively small, and the orbit is large and oval. The opercular bones, which form the great bulk of the head, have a semicircular edge behind, and a surface with rugulose ornamentation. Below and behind the inferior maxillary are generally seen the branchiostegal rays, of which there appear to be nine.

The scales are large, comparatively thick, rhomboidal (variously modified), smooth to the eye, but finely shagreened when magnified, and with plain margins. The dorso-ventral series are arranged in sloping curves; there are 36 such series along each flank, and 14 or 15 scales in each series in the thoracic region. The lateral line is marked by a longitudinal series of notched scales, somewhat above the centre of the body; these scales are wider than any of the others on the flank; the scales above and below the lateral line decrease in size gradually, as they do also from the anterior portion of the body backward. Though the scales have been described as smooth to the eye, it should be mentioned that they are all marked, just within their exposed margins, with two or more lines of increment of great regularity.

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The overlap of the scales is considerable; their articulation is assisted also as in other *Palæonisci*, &c., by teeth that project from the dorsal margin, and fit into sockets on the reverse of the ventral portion of the scales. In advance of each lobe of the caudal fin, and of the anal and dorsal, are placed four or five large scales, which are altogether different in form from the scales of the flank. They graduate from ovate or bluntly pointed scales to such as are lanceolate; and those of the latter form pass by insensible modifications into the fulcral scales or rays of the fin-borders.

There is more than one species to which this *Palæoniscus* has some resemblance; *P. Voltzii*, *P. fultus*, *P. angustus*, and *P. Vratislaviensis*, for instance, all appear related, though apparently distinct, forms. Perhaps the fish that this species most nearly resembles is *Palæoniscus glaphyrus*, Ag., of the Marl-slate. It resembles it in size, largeness of scales, smallness of gape, size of orbit, and in position and structure of fins; but it differs from it in having a comparatively larger head—the head of *P. glaphyrus* being only one-fifth of the entire length, whereas that of *P. varians* reaches one-third—and in having a large operculum, scales that vary more in size, and in having them with plain margins, while *P. glaphyrus* has them deeply serrated. *P. glaphyrus*, moreover, does not appear to have possessed the large notched scales that mark the lateral line in *P. varians*. With these differences before me, I have not hesitated to describe the present form as a distinct species.

P. varians has occurred in the laminated marls at the base of the Upper Limestone, in the strata immediately underlying the fish-bed, in the Dun Stone, and in the Main or Honeycomb Stone in the New Quarry at Fulwell; also in the fish-bed in the Old Quarry, Fulwell. And the fragment of a fish that I met with in the laminated limestone of Marsden apparently belongs to this species.

PALÆONISCUS ABBSII, *Kirkby*. Pl. IX, figs. 3*a*, 3*b*.

Annals of Nat. Hist., 3rd Series, vol. IX, p. 268.

Length from snout to end of caudal fin rather more than 4

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inches; length of body 3⅜ inches. Greatest width, which is a little in advance of the ventral fin, ⅝ inch; from this point the body contracts gradually to $\frac{3}{16}$ inch. From these measurements it will be seen that this species is an elongated form, the length of body being nearly six times the maximum width.

The head is an inch in length, and half an inch in breadth. The fins are of moderate size. The pectorals are about $\frac{6}{16}$ inch in length, and consist apparently of about 20 slender rays, with two short spine-like rays in front. The ventrals, which are comparatively small, are situated 1⅛ inch from the snout; the anal is 2¼ inches from the snout; and the dorsal is placed midway between the ventrals and the anal, or 2¼ inches from the snout. Of the anal and dorsal, the latter is the larger; but none of the specimens found show either these fins or the ventrals in a condition that permits the rays to be counted. The caudal fin springs from a tail apparently more heterocercal than in *P. varians;* it consists of 15 or 16 stout rays, which are margined on each lobe by numerous pointed fulcral scales.

The scales resemble those of *P. varians*, except in being longer compared with their breadth. They are arranged in more inclined dorso-ventral series than in *P. varians*, and there are about 12 in each series; but the scales are generally so much dislocated and confused as to render their numeration a matter of difficulty.

The distinguishing feature of this fish is its elongated form; and, except in being so much longer, it differs little from the preceding species.

From another elongated form of the same genus, *P. longissimus*, Ag., it differs in having much larger scales, and in their being smooth and unserrated at the margin; also in the relative position of the dorsal and ventral fins. From *P. Kablikæ*, another elongate Permian species, described by Dr. Geinitz, it differs in having a much blunter snout and smaller fins, as well as in a less elegant general form.

I have pleasure in naming this species after my friend the Rev. G. C. Abbs, of Cleadon—Durham's eldest student of geology.

Examples, chiefly fragments of about half-a-dozen individuals, have occurred in the fish-bed of the Old Quarry at Fulwell.

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PALÆONISCUS ALTUS, *Kirkby*. Pl. IX, fig. 1.

P. latus, Kirkby, Annals of Nat. Hist. 3rd Series, vol. IX, p. 268.*

Greatest length 2⅞ inches; length of body 2 inches; maximum breadth rather more than 1 inch, or more than one-half of the length of the body; breadth of tail ½ inch; head ⅝ inch long, and the same in width.

The general form of this fish is gibbous; the tail is only slightly heterocercal. The pectoral fins are small and slender; the ventrals, which are also small, are placed $1\frac{1}{16}$ inch from the snout, and the anal is $1\frac{7}{16}$ from the same point; the dorsal, which is the most robust of the fins mentioned, is situated at a point between the anal and the ventrals. The caudal is wide, and has about 24 strong rays: both lobes of this fin, as well as the anterior borders of the dorsal and anal, are protected by fulcral scales, as in both the preceding species; and in advance of the fulcrals are the large "écailles impaires," which so generally accompany them.

The scales of the flanks are of the same type as those of *P. varians*, but are comparatively wider and shorter. They are robust and smooth, except in having marginal lines of growth, and are arranged in steeply sloping dorso-ventral series.

The bones of the head are ornamented with the same kind of rugulose sculpturing as that which characterizes *P. varians*. The orbit is also large.

I do not know of any species of *Palæoniscus* that approaches *P. altus* in its great relative width of body, although in general form of scales, in fin-structure, and in ornamentation of the bones of the head it differs little from the two preceding species.

One or two examples of this species have been found in the fish-bed of the Old Quarry, Fulwell.

PALÆONISCUS ANGUSTUS? *Agassiz*.

Along with the *Palæonisci* previously described has occurred a specimen of what appears to be another species. It is chiefly

* At the suggestion of Sir Philip Egerton, I adopt the term *altus* for this species, *latus* having been already applied to another species of *Palæoniscus*.

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distinguished by its large fins and produced snout. In general appearance it has much resemblance to *P. angustus*, Ag., to which I provisionally refer it.

The specimen is in the collection of Mr. W. M. Wake, and was found in the Old Quarry, Fulwell.

PLANTÆ.

ULMANNIA SELAGINOIDES, *King*.

Several specimens have occurred, usually more or less fragmentary, of a vegetable that evidently belongs to the above species. The specimens are generally impressions, with traces of carbonaceous matter, the nervation of the leaves being occasionally shown on the impressed surface. The finest example is 11 inches long, with a branch of 3½ inches, and is in the Museum of Practical Geology, London.

ULMANNIA, sp ?

I have also examples of another plant, belonging apparently to the same genus as the preceding, but they are not sufficiently perfect to allow me to describe from them.

CALAMITES ARENACEUS ? *Brongn.*

Among the vegetable remains are two specimens of a Calamite, which I doubtfully refer to this species. The specimen in my possession is 4½ inches in length and nearly an inch in width. It shows two joints, 1½ inch distant from each other; and the impressed surface is rather finely striated longitudinally.

Besides the preceding species, a single specimen has occurred of a large reed-like plant which I have not been able to identify. It is 21 inches long and 1 inch broad, rather coarsely striate longitudinally, and without any indications of constrictions or joints. The specimen is in the collection of Mr. Arthur Dixon.

I have to acknowledge the assistance of Mr. Howse in determining the plants.

So far as may be judged from the fossils I have described, the physical conditions that prevailed during the deposition of the

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Fulwell Fish-bed were similar to those that obtained during the accumulation of the Marl-slate in the early part of the Permian era. The characteristic fossils of the Marl-slate are fishes belonging to the genera *Palæoniscus*, *Acrolepis*, *Pygopterus*, *Platysomus*, and *Cœlacanthus*, the species of the first genus being by far the most common. With the fish occur the remains of plants, chiefly belonging to *Ulmannia selaginoides*; and, rarely, examples of *Lingula*, *Discina*, and *Myalina*. The facies of this small fauna seems to me to be decidedly estuarine, though with a greater tendency to approach freshwater than marine conditions; for, while the vegetable remains, which indicate terrestrial and freshwater habitats, are distributed generally throughout the whole of the Marl-slate, the Mollusca, which seem as certainly to indicate marine conditions, are confined to a very limited area in the same deposit. In the Fulwell Fish-bed we have fish belonging to the same genera, and plants belonging to the same species, as those that occur in the Marl-slate, besides other plants whose occurrence there is not recorded. In this bed there are no Mollusca, nor is there, as I have before observed, a single trace of any marine organism. It would, therefore, seem as if the physical conditions of the Fulwell Bed had been even less marine than those of the Marl-slate; so that it is not unlikely that in its small group of species we see part of a freshwater fauna of the Permian period.

Another inference appears warrantable in respect of the fish; that is, that the presence of so predaceous-looking a species as *Acrolepis* among small and comparatively harmless *Palæonisci* evidently indicates that the latter were pursued and preyed upon by it. The association merely of these fish suffices to justify this inference; but the occasional presence of undigested remains of the *Palæonisci* between the scales of the abdominal region of the *Acrolepis* would as certainly seem to prove it. The occurrence of so many uninjured individuals of the *Palæonisci* along with the *Acrolepis* would further indicate that both the pursued and the pursuers were ultimately overtaken by circumstances that rendered powerless their instincts in one common catastrophe.

In conclusion I would remark, that though these fossils form,

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as it were, a distinct group in the Permian life-system, they are yet, on the one hand, connected with those of earlier Permian date by *Ulmannia selaginoides*, and probably by the *Acrolepis* and the *Palæoniscus* I have referred to *P. angustus*, which occur either in the Marl-slate of Durham or the Brandschiefer of Saxony; and, on the other hand, they would appear to be connected with the Triassic life-groups by the Calamite referred to *C. arenaceus*. Should the identification in this case prove correct, we then shall have at least a connecting link of species between the life-systems of the Palæozoic and Mesozoic eras. It would be premature, however, as yet distinctly to assert that such a connecting link exists; for though the tendency of the evidence that may be deduced from the fragments of the Calamite discovered may be in that direction, the evidence is, nevertheless, too imperfect to allow the decision to be clear of doubt.

EXPLANATION OF PLATE IX.

Fig. 1. Palæoniscus altus, *Kirkby*. Natural size. Old Quarry, Fulwell Hill.

Fig. 2. Palæoniscus varians, *Kirkby*. Natural size. New Quarry, Fulwell Hill.

Fig. 3. Palæoniscus Abbsii, *Kirkby*. *a*, anterior portion; *b*, posterior portion of the same fish. Natural size. Old Quarry, Fulwell Hill.

V.—*A Catalogue of the Recent Foraminifera of Northumberland and Durham.* By Henry B. Brady, F.L.S., F.G.S.

(Plate XII.)

The interest associated with that portion of the animal kingdom to which the Foraminifera belong has been much augmented of late years with the increased employment of the microscope as a means of research, and its extended use as a source of intellectual amusement. The publication, by the Ray Society, in 1858, of Professor Williamson's work on the Recent Foraminifera of Great Britain, and of Dr. Carpenter's philosophical "Introduction," in

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1862, has given a basis for the methodical study of the group before wanting to British naturalists.

Previous to the appearance of Professor Williamson's Monograph, the principal notices we have of the Foraminifera are contained in the works of the earlier conchological writers, by whom they were regarded as minute species of Mollusca. Viewing them in this light, Walker and Jacobs in 1784, and Montagu in 1803–1808, described and figured a considerable number of British forms, and although their descriptions are necessarily imperfect from defective knowledge of the nature of the animals inhabiting the shells, there is little or no difficulty in identifying the species which came under their observation. Subsequent writers on the Mollusca were content with resorting to the works of the authors just named for their information respecting the minuter shells, and we have consequently, for many years, no original matter of importance in connection with them, resulting from the labours of conchologists in our own country. On the continent, however, important additions were made during this period to the history of the group, chiefly from the researches of two French naturalists.

In 1826, M. Alcide D'Orbigny proposed a new classification of the Mollusca, in which "minute chambered shells" were separated and treated as a distinct "Order," with the title "*Foraminifères*," a name which has kept its place, notwithstanding other terms have from time to time been proposed, and is still used to designate the Order. Although this arrangement of the Mollusca has not been adopted by scientific men, and his appreciation of the characters of the Foraminifera was founded in error, it must be allowed that the importance which became attached to them, from the mere fact of their separation into a distinct group, was one great cause of their subsequent closer study. M. D'Orbigny devoted himself almost exclusively to their investigation, and the numerous monographs which proceeded from his pen during the succeeding twenty years are sufficient evidence of the extent and diligence of his labours.

Whilst D'Orbigny was thus engaged in working systematically on the organisms included in his newly founded group, a fellow-countryman, M. Dujardin, was with equal zeal studying their

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physiological relations, and the results of his researches were published in the year 1835. Therein the true nature of Rhizopodous animals was demonstrated, their low organization satisfactorily established, and the Foraminifera finally separated from the Cephalopodous Mollusca with which they had hitherto been associated.

There is little that need be noticed in the more recent literature of the subject, although few divisions of the animal kingdom have been written upon to the same extent or so variously. The more important works are well known, and easily accessible to students.

The conditions under which animals of purely microscopic nature exist is obviously unfavourable to the preparation of a local catalogue. In many classes of microzoa the difficulties are insuperable, but there are circumstances in connection with the distribution of the Foraminifera which permit the attempt to be made with reasonable prospect of completeness. One of the most important of these is the wide area over which the several forms are found; for, although the character of a Rhizopodal fauna is influenced not only by latitude but also by depth of water, the amount of variation from these causes in a short coast-line, with the depth of water seldom exceeding 40 fathoms, is scarcely appreciable. The limited powers of locomotion with which the little creatures are endowed, and the situation they most affect (the surface of the mud or sand at the bottom of the sea) render the collection of specimens by means of the dredge an easy and productive process. Abundance of the shells of shallow water species may be found in the shore-sands of our coast between tide-marks, commonly associated with those of the smaller mollusca and fragments of zoophytes. Whilst therefore some indulgence may be claimed on the ground of the difficulties inherent in the subject, it is not probable that many forms have eluded the careful search made for them.

The material which has been subjected to examination has been derived in part from the dredging operations conducted during the past three years under the auspices of the Field-Club, and in part from littoral sands collected from the ripple-marks

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near low water, or taken from shore-pools. The dredgings fairly represent the coast from Berwick Bay on the north, to Seaham on the south, the depth varying from 10 to 45 fathoms. I am much indebted to my brother, Mr. George S. Brady, and to Mr. George Hodge, for the careful preservation of material from the various localities worked over. The littoral sands examined have been taken chiefly from the Northumberland coast at intervals between Alnmouth and Tynemouth. The sea-beach to the south of the Tyne is composed for the most part of shingle and gravel, derived in great measure from ballast cast at sea, and its unfavourable nature has deterred me from spending much time in searching it.

The quantity of material from each locality has generally been ample, and a uniform method has been pursued for the separation and the collection of the Foraminifera. The sands were first thoroughly dried, and the coarser portions, separated by sifting, examined, without further treatment, by means of a magnifying glass. Professor Williamson's method of "floating" was adopted as the best means of saving time and labour in the examination of the fine siftings. This process depends for its efficacy on the light specific gravity of the shells, owing to their chambers containing air; and practically it works exceedingly well for the minuter forms. The only precaution which seems to be requisite is, that the material should be very carefully dried at the outset; if this be not done the sarcode, impregnated with saline matter, retains its form and partially fills the cavities of the shells, thereby rendering them too heavy to float. The larger thick-shelled species, whether porcelanous or arenaceous, cannot be separated in this way.

In a somewhat different category, and worthy of separate mention as a locality for Foraminifera, are the brackish-water pools of the marshy ground in Hylton Dene, near Sunderland.*

* To the student of the lower forms of animal life Hylton Dene may be looked upon as a thing of the past; like Prestwick Car and Boldon Flats it has, alas, fallen a victim to the "march of civilization" so called, which is fast invading the pleasant resorts of the naturalist, converting good collecting-grounds into bad pastures. When we visited the place a few weeks ago the pools were dry—the marsh was cut and scored in all directions with draining channels, and we wandered about conscious that it was the last opportunity we might have of obtaining any of the rarities for which this was the only locality in our district.

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The zoology of these pools formed the subject of a paper by Mr. G. S. Brady, read before the British Association in 1863, and printed in the sixth volume of the Transactions of the Tyneside Naturalists' Field-Club (p. 95); but through an oversight the species of Foraminifera found in them were not enumerated. Since that time I have visited the spot and collected material of every sort likely to repay examination. The Foraminifera inhabiting brackish water have received but little attention hitherto; and probably, if they were searched for, it would be found that they are not as dependent on marine saline matters for their existence as has been generally supposed. The pools alluded to are situated a couple of miles above Sunderland (perhaps two miles and a half from the sea) near the point where a little stream discharges itself into the River Wear, in low marshy ground, which in occasional floods, or at exceptionally high tides, is covered with water. The proportion of saline matters they contain of course varies considerably, and is dependent on the relative supply of fresh water from rain and drainage and of salt water from the occasional tidal overflow; but commonly the water is scarcely brackish to the taste, and when examined by my brother, the amount of chlorides in the Foraminifera-yielding pools was but little more than 1 per cent., or less than one-third the amount present in sea-water. Notwithstanding this, the mud collected from them, after careful washing, revealed astonishing numbers of Foraminifera, chiefly specimens of *Polystomella striato-punctata* and *Quinqueloculina agglutinans*, a few specimens of *Trochammina inflata*, and a single *Globigerina bulloides*. There are at intervals along the lower portions of our coast, places in which brackish water collects in a similar way, but they are generally nearer to the sea, and have scarcely the amount of zoological interest that pertains to the one just alluded to; they promise however to repay examination, at any rate, so far as their Rhizopodal fauna is concerned. I have very recently examined some mud from pools of this sort near the mouth of the Wansbeck with gratifying results. The "very rare" *Trochammina inflata* is here the prevailing Foraminifer, *Polystomella*

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striato-punctata, common, and *Quinqueloculina agglutinans*, rare; whilst in addition to these species we have *Rotalia Beccarii* and *Nonionina depressula* both occurring in considerable numbers.

Such a fauna as these two lists represent is the precise counterpart of that of a portion of the Post-Tertiary clay of Northamptonshire. Mr. W. K. Parker, who has carefully studied the semi-fossilized Rhizopoda of the clays immediately underlying the peat in the Fen Country, had set down the area around Peterborough (30 miles from the sea) as a marginal, brackish water deposit; a view which is strongly confirmed by the facts now adduced. *Quinqueloculina agglutinans* has not before been found in a recent condition in a British locality, and forms an important addition to our living fauna. It can scarcely be supposed that these are the only species which have been carried on to the ground by the rise of the sea; but rather that they have been able to accept the new conditions of life whilst others with less power of adaptation have died out. The very thin shells and green sarcode of many of the specimens of *P. striato-punctata* and *N. depressula*, and the scarcely more than chitinous carapace of some of the *Miliolæ* show an approximation to the characters of the lower fresh-water Rhizopoda.

The number of species and varieties of Foraminifera hitherto discovered on the British coast may be set down at 113—this includes many which have been found since the publication of Professor Williamson's monograph. Of these, 74, or about two-thirds of the entire list, have been taken off the counties of Northumberland and Durham. Eleven out of the 74 forms are not given by Williamson, and they will be found figured in Plate XII of the present volume, with the exception of *Quinqueloculina agglutinans* which has been found since the plate was engraved. Two are now described for the first time, and appear in the Catalogue under the names of *Uvigerina irregularis* and *Textularia complexa*. Five others have not before been recorded from a British locality, viz., *Spiroloculina excavata*, D'Orb.; *Quinqueloculina subrotunda*, Montagu; *Quinqueloculina agglutinans*, D'Orb.; *Truncatulina refulgens*, Montfort; and *Nonionina Scapha*, F. & M.

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The remaining four had occurred previously in dredgings from the Shetland Islands, and are referred to at greater length in the Transactions of the Linnean Society, vol. XXIV, Part III.

There is not much to remark relative to the general distribution of the species. The prevalence of the *Lagenæ* at every point which has been dredged is an interesting fact; all the British species having been taken, most of them in considerable numbers. The great abundance of the *Dentalinæ* and *Vaginulinæ* on some portions of the Northumberland coast is worth recording, especially as the same localities furnish large numbers of *Polymorphinæ*, with the luxuriant "stag-horn" outgrowths (*P. tubulosa*, D'Orb.), thereby seeming to indicate an unusually rich feeding-ground, or the existence of other conditions favourable to their growth.

In reporting upon the Mollusca obtained in the dredging excursions of 1863, Mr. Alder remarks* that the fauna of our coast "upon the whole, approaches more nearly to the Scandinavian than to that of the South of England." An examination of the Rhizopoda quite confirms this view; and, as we have a means of comparison in Messrs. Parker and Jones's paper on "Foraminifera from the Coast of Norway,"† it may be interesting to trace the analogy. The number of species given in the paper alluded to is 26, and of these 18 belong also to our list; or, including some of the more permanent varietal forms, 45 would represent the Norwegian fauna, of which over 30 are equally at home on our coast. The occurrence of *Lagena distoma* and *Nonionina Scapha* is important in its bearing on this connection, as both are prominent forms in the Scandinavian seas, and neither have as yet been taken off Britain except on the north-eastern and northern shores.

One of the greatest difficulties the naturalist of the present day has to contend with is to be found in the entangled state into which the nomenclature of many divisions of the animal kingdom has fallen. Formerly, authors were but little accustomed to respect the labours of their predecessors, even when of their own country; but when such researches had been made public through

* Transactions of the Tyneside Naturalists' Field-Club. Vol. VI, p. 180.

† Annals and Magazine of Natural History. 2nd Series. Vol. XIX, p. 273.

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the medium of another language their existence was commonly entirely ignored. Hence we find that many of the commoner types of the Foraminifera have received fresh names from almost every successive writer who has noticed them. Add to this the fact only recently fully appreciated, that a much wider range of variation must be allowed in grouping these protean animals than it is the custom to admit in the more highly organized classes with which the Foraminifera were for long associated, and we have elements of confusion which could not well be surpassed.

Owing partially to the low organization of the Protozoa, and partly to the unusual facilities which they offer for comparative study, we probably possess the elements of a fuller knowledge of their natural relationships than has yet been attained in respect to animals of more complex structure. Thus the relationship of individuals to a sub-varietal form, of several such sub-varieties to a variety of greater permanence, of many varieties to a subtype, and of a group of subtypes to one central type may often be traced. Yet none of these groups would exactly correspond to what would be regarded as a *genus* or a *species* in the true Linnean sense. Probably what is included in the term "type" would most nearly represent a "species," but it is doubtful whether, if it were used in an absolute sense, representing a group which does not inosculate with any other parallel series, the list would have to be still further reduced. The "types," nevertheless, embrace large numbers of so-called species, and often even many quasi-genera; but, though it is easy to pick out and name the prominent varietal forms, there are no sharp lines of demarcation between them, but the individuals constitute a continuous series in which the degree of differentiation between the successive specimens becomes less and less sensible as the number of constituents is increased.

That this tendency to variation exists amongst Protozoa lower in organization than the Foraminifera, possibly to an even greater extent, has been fully demonstrated by Dr. Wallich in his recent admirable papers in the Annals and Magazine of Natural History, and indeed is only what might have been expected. Thus the naked Rhizopoda seem all referable to one primary type

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whose fullest development appears in *Amœba villosa*; and the more numerous series which are possessed of a test or carapace, whether chitinous or composite, are developments of a very limited number of specific forms, their mere external features whether of shape, size, or the material of which the test is composed, varying with the nature of the influences to which they have been subjected during growth, and yielding no characters for generic or even specific divisions.

These facts but little affect the importance with which minute characters in the Foraminifera are to be regarded; for the indications of climatal and bathymetrical conditions, which may be obtained by their study, are of much value both to zoological and geological science. No advantage would be gained by attempting to alter the nomenclature so as to express the complicated relationship just pointed out, even were this possible; and the Linnean binomial system possesses such obvious advantages on the ground of convenience and simplicity, that it becomes necessary to adhere to it even though the terms genus and species be used in a purely conventional sense.

The names used throughout the Catalogue are adopted, with a little correction, from the Appendix supplied by Messrs. Parker and Jones to Dr. Carpenter's "Introduction to the Study of the Foraminifera" (page 309); but references are given to the figures of the species in Professor Williamson's "Recent Foraminifera of Great Britain." Those who take interest in the subject I would refer to the paper before mentioned "On the Rhizopodal Fauna of the Shetlands,"* in which some of the questions here spoken of are treated at greater length, and a classified table of nearly the whole of the British forms is given.

The following are the types under which the forms enumerated in the Catalogue may be grouped:—

Cornuspira foliacea, *Phil.*

Miliola Seminulum, *Linn.*, including *Biloculina*, *Triloculina*, *Quinqueloculina*, and *Spiroloculina*.

Trochammina squamata, *P. & J.*

Lituola nautiloidea, *Lamk.*

* Transactions of the Linnean Society. Vol. XXIV, part III.

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Valvulina triangularis, *D' Orb.*

Lagena sulcata, *W. & J.*

Nodosarina Raphanus, *Linn.*, including *Nodosaria*, *Dentalina*, *Vaginulina*, and *Cristellaria*.

Polymorphina lactea, *W. & J.*

Uvigerina pygmæa, *D' Orb.*

Orbulina universa, *D' Orb.*

Globigerina bulloides, *D' Orb.*

Textularia agglutinans, *D' Orb.*, including *Textularia*, *Bigenerina*, and *Verneuilina*.

Bulimina Preslii, *Reuss*, including *Bulimina*, *Virgulina*, and *Bolivina*.

Cassidulina lævigata, *D' Orb.*

Discorbina trochidiformis, *Lamk.*

Planorbulina farcta, *F. & M.*, including *Planorbulina* and *Truncatulina*.

Rotalia Beccarii, *Linn.*

Patellina concava, *Lamk.*

Polystomella crispa, *Linn.*, including *Polystomella* and *Nonionina*.

Sub-kingdom. PROTOZOA.

Class. RHIZOPODA.

Order. RETICULARIA.

(FORAMINIFERA.)

Sub-order. IMPERFORATA.

Fam. MILIOLIDA.

1. CORNUSPIRA, *Schultze.*

1. C. FOLIACEA, *Philippi.* Spirillina foliacea. Rec. For. Gt. Br. Pl. VII, figs 199–201.

In dredgings off Holy Island, 25 to 40 fathoms; very rare. A single specimen from deep water off Seaham Harbour. Cullercoats, Mr. Alder.

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2. BILOCULINA, *D'Orb.*

1. B. RINGENS, *Lamk.* Biloculina ringens. Rec. For. Gt. Br. Pl. VI, figs. 169, 170; and Pl. VII, fig. 171.

Common, especially in shallow water and amongst littoral sands.

2. B. DEPRESSA, *D'Orb.* B. ringens, *var.* carinata. Rec. For. Gt. Br. Pl. VII, figs. 172–174.

Abundant everywhere along the coast.

3. B. ELONGATA, *D'Orb.* B. ringens, *var.* Patagonica. Rec. For. Gt. Br. Pl. VII, figs. 175, 176.

Not uncommon in dredged sands.

3. SPIROLOCULINA, *D'Orb.*

1. SP. LIMBATA, *D'Orb.* Spiroloculina depressa. Rec. For. Gt. Br. Pl. VII, fig. 177.

Common in dredgings from all depths.

2. SP. PLANULATA, *Lamk.* Sp. depressa, *var.* rotundata. Rec. For. Gt. Br. Pl. VII, fig. 178.

Common.

3. SP. EXCAVATA, *D'Orb.* [Plate XII, fig. 1.]

Though not recognized by Professor Williamson, this is a tolerably well marked sub-varietal form of *Spiroloculina*, characterized by its thick edges and deeply sunk centre. It is described and figured by D'Orbigny, in his work on the "Fossil Foraminifera of the Vienna Basin," p. 270. Pl. XVI, figs. 19–21.

In deep water, Northumberland and Durham coast, somewhat rare.

4. TRILOCULINA, *D'Orb.*

1. T. TRIGONULA, *Lamk.* Miliolina trigonula, Rec. For. Gt. Br. Pl. VII, fig. 180–182.

Abundant all along the coast.

2. T. OBLONGA, *Montagu.* Miliolina Seminulum, *var.* oblonga. Rec. For. Gt. Br. Pl. VII, figs. 186, 187.

Common.

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5. QUINQUELOCULINA, *D'Orb.*

1. Q. SEMINULUM, *Linn.* Miliolina Seminulum. Rec. For. Gt. Br. Pl. VII, figs. 183–185.

Common everywhere.

This may be looked upon as the "type" or central form to which the whole of the *Biloculinæ*, *Spiroloculinæ*, *Triloculinæ*, and *Quinqueloculinæ*, specifically belong. To those whose studies have been confined to more highly organized animals, it may seem strange to regard forms which in their full development appear severally to possess marked distinctive characters, as varieties of a single species; but the examination of large numbers of specimens leaves no doubt that this is a correct conclusion. Some general observations on this subject are given in the introductory remarks.

2. Q. BICORNIS, *W. & J.* Miliolina bicornis, Rec. For. Gt. Br. Pl. VII, figs. 190–194.

Common.

3. Q. SECANS, *D'Orb.* Miliolina Seminulum, *var.* disciformis. Rec. For. Gt. Br. Pl. VII, figs. 188, 189.

Common.

4. Q. FERUSSACII, *D'Orb.* Miliolina bicornis, *var.* angulata. Rec. For. Gt. Br. Pl. VII, fig. 196.

One or two small specimens of a sub-angular, ribbed Quinqueloculina, found in sand dredged off Coquet Island, may, with some reservation, be assigned to this form.

5. Q. SUBROTUNDA, *Montagu.* [Pl. XII, fig. 2.]

Montagu, in his "Testacea Britannica" (p. 521), describes a sub-orbicular *Miliola* figured in Walker's "Testacea minuta" (fig. 4), under the name of *Vermiculum subrotundum*. Any doubt which the somewhat vague description might leave as to the species intended is dispelled by reference to Walker's drawing, which represents a possibly not fully grown specimen of an outspread, round-edged *Quinqueloculina*, without surface-ornamentation. Diameter $\frac{1}{20}$th of an inch.

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Its nearest ally is *Q. secans*, D'Orb., a well known form, more oblong in contour, and having the extremities somewhat pointed; the edges thin and sharp, often carinate, the surface commonly marked by slight ribs across the chambers. These characters are sufficient to distinguish the two. In Professor Williamson's work, *Q. subrotunda* is given as a synonym for *Miliolina* (*Triloculina*) *trigonula*, possibly owing to Montagu's description.

Not uncommon in shallow water and amongst littoral sands.

6. Q. AGGLUTINANS, *D'Orb.*

A feeble variety of *Quinqueloculina* in which the normal, white, porcelanous test is replaced by a composite shell, composed of arenaceous particles embedded in a chitinous matrix with but little calcareous matter. It is figured by D'Orbigny in his "Cuba" monograph, Plate XII, figs. 11–13. (Folio edition.)

In the brackish-water pools of Hylton Dene, common; in pools at the mouth of the Wansbeck, rare.

FAM. LITUOLIDA.

1. TROCHAMMINA, *P. & J.*

1 T. INFLATA, *Montagu.* Rotalina inflata. Rec. For. Gt. Br. Pl. IV, figs. 93, 94.

In brackish water at the mouth of the Wansbeck, very common; in similar pools in Hylton Dene, rare.

It seems curious that this well-marked species, which has been only found hitherto by single specimens on the south-west coast of England, and in one or two localities on the west and north of Scotland, and has never been discovered either in dredged or littoral sands, on our shores, should have adopted these brackish-water pools as a resting place. In the Northumberland locality it seems to thrive better than any of its congeners. The specimens are commonly fine, exhibiting the peculiar sub-arenaceous shell and dark coloured earlier chambers well delineated in Professor Williamson's figures.

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2. LITUOLA, *Lamk.*

1. L. SCORPIURUS, *Montfort.* [Pl. XII, fig. 3.]

A few small specimens of this interesting arenaceous species have been collected from the material taken at the greatest depths on both the Northumberland and Durham coast. Except in the Shetland dredgings of Mr. J. Gwyn Jeffreys, I do not know that it has been found elsewhere in a British locality.

2. L. CANARIENSIS, *D'Orb.* Nonionina Jeffreysii. Rec. For. Gt. Br. Pl. III, figs. 72, 73.

Tolerably common in dredged sands from all parts of the coast; but seldom found at a depth of less than 15 or 20 fathoms.

3. VALVULINA, *D'Orb.*

1. V. AUSTRIACA, *D'Orb.* Rotalina fusca. Rec. For. Gt. Br. Pl. V, figs. 114, 115.

This is a rare species in the British seas, and only three specimens have been found on our coast. They were from the Holy Island dredgings, in 35 to 40 fathoms.

SUB-ORDER, PERFORATA.

FAM. LAGENIDA.

1. LAGENA, *Walker.*

1. L. SULCATA, *W. & J.* Lagena vulgaris, *var.* striata; L. vulgaris, *var.* interrupta; and Entosolenia costata. Rec. For. Gt. Br. Pl. I, figs. 10, 11, & 18.

Common, both on the Northumberland and Durham coasts.

2. L. LÆVIS, *Montagu.* Lagena vulgaris; L. vulgaris, *var.* clavata; L. vulgaris, *var.* perlucida. Rec. For. Gt. Br. Pl. I, figs. 5, 6, 7.

Abundant.

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3. L. STRIATA, *Montagu*. Lagena vulgaris; *var*. gracilis, L. vulgaris, *var*. substriata. Rec. For. Gt. Br. Pl. I, figs. 12, 13, 14.

Abundant.

4. L. SEMISTRIATA, *Will*. Lagena vulgaris, *var*. semistriata. Rec. For. Gt. Br. Pl. I, figs. 8, 9.

Common.

5. L. GLOBOSA, *Montagu*. Entosolenia globosa. Rec. For. Gt. Br. Pl. I, figs. 15, 16.

6. L. MARGINATA, *Montagu*. Entosolenia marginata, and *vars*. lucida, ornata, lagenoides, and quadrata. Rec. For. Gt. Br. Pl. I, figs. 19 to 28.

Abundant.

7. L. SQUAMOSA, *Montagu*. Entosolenia squamosa; E. squamosa, *var*. scalariformis, and *var*. hexagona. Rec. For. Gt. Br. Pl. I, figs. 29, 30, & 32.

Somewhat common.

8. L. MELO, *D'Orb*. Entosolenia squamosa, *var*. catenulata. Rec. For. Gt. Br. Pl. I, fig. 31.

Berwick Bay, rare.

9. L. CAUDATA, *D'Orb*. Entosolenia globosa, *var*. lineata. Rec. For. Gt. Br. Pl. I, fig. 17.

Rare.

10. L. DISTOMA, *P. & J.* [Pl. XII, fig. 4.]

This is a rare variety, and its delicacy and minute size render it liable to be overlooked even when present in dredged sand. A single specimen from Shetland described and figured with other forms new to Britain in the paper before alluded to (Trans. Linn. Soc., vol. XXIV, p. 467, plate XLVIII, fig. 6), is the only instance hitherto recorded of its occurrence in our seas. From the Northumberland and Durham coast, about twenty specimens in all have been collected. From Holy Island on the

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north to Seaham on the south they have been pretty evenly distributed, always occurring in the deeper dredgings (30 to 45 fathoms), and seldom more than two or three examples in one parcel of sand. It is not uncommon in the Norwegian seas, and was first noticed by Messrs. Parker and Jones in their memoir on "Foraminifera from the Coast of Norway." (Ann. & Mag. Nat Hist., 2nd Series, vol. XIX.)

2. NODOSARIA, *Lamk.*

1. N. SCALARIS, *Batsch.* Nodosaria radicula. Rec. For. Gt. Br. Pl. II, figs. 36–38.

In the Appendix to Carpenter's "Introduction," this species is given as *N. longicauda*, D'Orb.; Batsch, however, had previously described and figured the same form under the specific designation "*scalaris*," which name therefore takes precedence.

Occurs very sparingly in deep water sands all along the coast.

2. N. PYRULA, *D'Orb.* Nodosaria Pyrula. Rec. For. Gt. Br. Pl. II, fig. 39.

In dredgings 30 to 45 fathoms; Berwick Bay, off Holy Island, and off Seaham Harbour. Very rare. It is only under very favourable circumstances that this slender and delicate shell can be obtained entire; nearly all the specimens I have seen are more or less broken.

3. DENTALINA, *D'Orb.*

1. D. COMMUNIS, *D'Orb.* Dentalina subarcuata. Rec. For. Gt. Br. Pl. II, figs. 40, 41.

Common; especially so on the northern portion of the Northumberland coast. Specimens of this species, together with *Vaginulina Legumen* and *V. linearis*, were collected in astonishing quantities in the material brought home from Berwick Bay in 1862.

4. VAGINULINA, *D'Orb.*

1. V. LEGUMEN, *Linn.* Dentalina Legumen. Rec. For. Gt. Br Pl. II, fig. 45.

Common.

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2. V. LINEARIS, *Montagu*. Dentalina Legumen. Rec. For. Gt. Br. Pl. II, figs. 46–49.

Very common.

5. CRISTELLARIA, *Lamk.*

1. C. ROTULATA, *Lamk.* Cristellaria Calcar, and C. rotifer. Rec. For. Gt. Br. Pl. II, figs. 52–54.

Berwick Bay, rare. Off Holy Island, very rare. Mr. Alder has specimens collected from shore-sands at Tynemouth.

2. C. CREPIDULA, *F. & M.* Cristellaria Calcar, *var.* oblonga and C. subarcuatula. Rec. For. Gt. Br. Pl. II, figs. 55–59.

Off Holy Island, very rare. Cheswick, Northumberland, rare; Mr. Alder.

6. POLYMORPHINA, *D'Orb.*

1. P. LACTEA, *W. & J.* Polymorphina lactea, and *vars.* acuminata, oblonga, concava, and communis. Rec. For. Gt. Br. Pl. VI, figs. 146–149; 151–155.

Very common

2. P. COMPRESSA, *D'Orb.* Polymorphina lactea. Rec. For. Gt. Br. Pl. VI, fig. 145.

3. P. TUBULOSA, *D'Orb.* Polymorphina lactea, *var.* fistulosa. Rec. For. Gt. Br. Pl. VI, fig. 150.

Occasional examples are met with in muddy dredgings from any portion of our coast; but in certain localities, as in Berwick Bay, almost every specimen of *Polymorphina* takes on the "stag-horn" outgrowths, which form the only peculiarity of this variety.

7. UVIGERINA, *D'Orb.*

1. U. PYGMÆA, *D'Orb.* Uvigerina pygmæa. Rec. For. Gt. Br. Pl. V, figs. 138, 139.

A broken specimen only. Off Holy Island, 35 to 40 fathoms.

2. U. ANGULOSA, *Will.* Uvigerina angulosa. Rec. For. Gt. Br. Pl. V, fig. 140.

The genus *Uvigerina* is evidently not "at home" in our latitude at a less depth than 40 to 50 fathoms, and there are but

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few spots on the Northumberland or Durham coast where this depth is attained. In the deeper water off the coast of Scotland specimens are of much more frequent occurrence, and still further north, in the Shetland seas, both *Uvigerina angulosa* and the more robust typical form *U. pygmæa* are plentiful.

Durham coast, deep water off Marsden and Seaham; very rare.

3. U. IRREGULARIS, *nov. spec.* [Pl. XII, fig. 5.]

Description. Shell oblong, ovato-acuminate, consisting of irregular chambers arranged in an obscure spiral, the terminal chamber prolonged into a short neck in which the aperture is situated. Surface smooth, free from costæ or other ornamentation, but perforated by numerous small foramina. Colour, brownish. Length $\frac{1}{36}$ of an inch. Holy Island, very rare.

The thin, perforated shell, irregular segments, and freedom from surface-markings, are sufficient to distinguish this form from other species of the same genus.

Obtained from the Northumberland dredgings (off Holy Island) 1864.

FAM. GLOBIGERINIDA.

1. ORBULINA, *D'Orb.*

1. O. UNIVERSA, *D'Orb.* Orbulina universa. Rec. For. Gt. Br. Pl. 1, fig. 4.

Rare. *Orbulina universa* shows the same tendencies in its distribution as *Globigerina bulloides*, with which species it is commonly associated in deep-sea soundings. It is very rare at depths of less than 50 fathoms, and the few specimens which have occurred in the deeper dredgings of the Northumberland and Durham coasts, where the depth seldom exceeds from 35 to 45 fathoms, have been the feeble brownish shells of starved specimens. From Professor Williamson's figure I judge that his examples are in the same condition. Mr. Jeffreys' Shetland sands, taken at 70 to 95 fathoms, yield abundance of pure white specimens; and soundings from the abysmal depths of the Atlantic and the Mediterranean furnish still larger numbers.

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2. GLOBIGERINA, *D'Orb.*

1. G. BULLOIDES, *D'Orb.* Globigerina bulloides. Rec. For. Gt. Br. Pl. V, figs. 116–118.

Rare. A few small specimens from Berwick Bay and off Holy Island, 30 to 35 fathoms. A single example from the Durham coast, off Seaham, 40 fathoms. One specimen from the brackish-water pools in Hylton Dene.

See remarks on the last named species, *Orbulina universa.* The brownish mud of which the ocean-"floor" is composed at the greatest depths reached by the sounding-line consists almost entirely of the shells of *Globigerina* and *Orbulina*, either whole or in fragments, and represents a condition very similar to that which must have existed when some of the Cretaceous rocks were in process of formation.

3. TEXTULARIA, *Defrance.*

1. T. VARIABILIS, *Will.* Textularia variabilis. Rec. For. Gt. Br. Pl. VI, figs. 162, 163, 168.

Rare.

2. T. COMPLEXA, *nov. spec.* [Pl. XII, figs. 6, a.b.]

Description. Shell oblong, compressed. The earlier chambers taking a helicoid or spiral direction of growth, but assuming the biserial, Textularian arrangement after the formation of five or six chambers. Texture, sub-hyaline, with well defined foramina. Colour nearly white. Length $\frac{1}{60}$th of an inch.

The polymorphic character of the genus Textularia is well exemplified in the tendency of its various forms to take on a spiral mode of growth. Messrs. Parker and Jones in their paper on Arctic Foraminifera, now in the press, have figured the rougher, more arenaceous varieties so modified. The one now described is nearly related to the *Textularia variabilis* of Williamson. Ehrenberg in his memoir "Ueber den Grünsand," published in the Berlin Transactions for 1855, gives a drawing of a cast of one of these coiled *Textulariæ* (plate IV, fig. 13), with the new generic name *Spiroplecta*, but does not venture on specific characters.

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3. T. PYGMÆA, *D'Orb.* Textularia variabilis, *var.* spathulata. Rec. For. Gt. Br. Pl. VI, figs. 164, 165.

Rare. A few specimens from the Dogger Bank.

4. T. SAGITTULA, *Defrance.* Textularia cuneiformis. Rec. For. Gt. Br. Pl. VI, figs. 158, 159.

Common all along the coast.

5. T. TROCHUS, *D'Orb.* Textularia cuneiformis, *var.* conica. Rec. For. Gt. Br. Pl. VI, figs. 160, 161.

Not uncommon.

4. BIGENERINA, *D'Orb.*

1. B. DIGITATA, *D'Orb.* [Pl. XII, fig. 7.]

Very rare (broken specimens only); off Seaham, 35 to 45 fathoms.

Though I have not been fortunate enough to meet with any perfect specimen on our coast, the fragments which have been found are sufficiently characteristic to leave no doubt as to the species to which they belong. The species occurs sparingly in the Shetland seas, and recently one or two well marked specimens of the other D'Orbignian form *B. Nodosaria* have been found in sands dredged in 90 fathoms in the same northern locality. For figure of a perfect specimen see Trans. Linn. Soc., vol. XXIV, plate XLVIII, fig. 8.

5. VERNEUILINA, *D'Orb.*

1. V. POLYSTROPHA, *Reuss.* Bulimina scabra (at page 65); Bulimina arenacea (at page 98). Rec. For. Gt. Br. Pl. V, figs. 136, 137.

Very rare. A single fine specimen from deep water off Holy Island.

6. BULIMINA, *D'Orb.*

1. B. PUPOIDES, *D'Orb.* Bulimina pupoides. Rec. For. Gt. Br. Pl. V, figs. 124, 125.

Rare. A few specimens have been found in most of the dredgings, whether on the Northumberland or Durham coast.

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2 B. MARGINATA, *D'Orb.* Bulimina pupoides, *var.* marginata. Rec. For. Gt. Br. Pl. V, figs. 126, 127.

Common.

3. B. ACULEATA, *D'Orb.* Bulimina pupoides, *var.* spinulosa. Rec. For. Gt. Br. Pl. V, fig. 128.

This is in reality only the foregoing form *B. marginata*, with the serrations of the chamber-margins somewhat exaggerated so as to form spinous processes. Some of the Seaham Harbour specimens fairly come under this variety, though none are quite so strongly marked as Professor Williamson's figure.

4. B. OVATA, *D'Orb.* Bulimina pupoides, *var.* fusiformis. Rec. For. Gt. Br. Pl. V, figs. 129, 130.

Off Coquet Island, rare.

5. B. ELEGANTISSIMA, *D'Orb.* Bulimina elegantissima. Rec. For. Gt. Br. Pl. V, figs. 134, 135.

Very rare. One or two specimens only, from Berwick Bay.

7. VIRGULINA, *D'Orb.*

1. V. SCHREIBERSII, *Czjzek.* Bulimina pupoides, *var.* compressa. Rec. For. Gt. Br. Pl. V, fig. 131.

Berwick Bay, very rare.

8. BOLIVINA, *D'Orb.*

1. B. PUNCTATA, *D'Orb.* [Pl. XII, figs. 8, a.b.]

Off Holy Island, very rare.

Although biserial in the arrangement of its chambers, *Bolivina* belongs typically to a triserial group, *Bulimina*. The relationship may be traced in the twisted aperture and usually curved mode of growth. The strong resemblance which this species, in the feeble condition in which it is found in the British seas, bears to the young of some of the *Textulariæ*, has probably caused it to be overlooked by many observers. Mr. W. K. Parker has

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in his collection specimens of the ribbed variety *B. costata*, D'Orb., from the west coast of Scotland.

Neither species is mentioned in the Monograph of Recent Foraminifera of Great Britain.

9. CASSIDULINA, *D'Orb.*

1. C. LÆVIGATA, *D'Orb.* Cassidulina lævigata. Rec. For. Gt. Br. Pl. VI, figs. 141, 142.

Very rare. In dredgings 25 to 40 fathoms, off Holy Island.

2. C. CRASSA, *D'Orb.* Cassidulina obtusa. Rec. For. Gt. Bt. Pl. VI, figs. 143, 144.

A single specimen from 35 fathoms, Berwick Bay.

The remarks upon *Uvigerina* apply equally to the genus *Cassidulina;* neither are "at home" on our coast, probably on account of the shallowness of the water.

10. DISCORBINA, *P. & J.*

1. D. GLOBULARIS, *D'Orb.* Rotalina concamerata (young). Rec. For. Gt. Br. Pl. IV, figs. 104, 105.

Very common. Often found growing attached to sea-weeds and corallines.

Professor Williamson erroneously figures this as the young of an entirely distinct species. The fact, that whilst the so-called young form (*Discorbina globularis*) is common in every stage of growth, that which is figured as the matured shell (*Pulvinulina repanda*) has never been found on our coast, would alone strongly militate against the identity of the two forms.

2. D. ROSACEA, *D'Orb.* Rotalina Mamilla. Rec. For. Gt. Br. Pl. IV, figs. 109-111.

Small specimens are not uncommon in the deeper dredgings both on the Northumberland and Durham coasts.

11. PLANORBULINA, *D'Orb.*

1. P. MEDITERRANENSIS, *D'Orb.* Planorbulina vulgaris. Rec. For. Gt. Br. Pl. V, figs. 119, 120.

Very common, both in dredged and littoral sands.

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12. TRUNCATULINA, *D'Orb.*

1. T. LOBATULA, *Walker*. Truncatulina lobatula. Rec. For. Gt. Br. Pl. V, figs. 122-123.

Very common.

2. T. REFULGENS, *Montfort*. [Pl. XII, figs. 9, a.b.c.]

This has not hitherto been regarded as a British variety. It is little more than an exaggerated condition of *T. lobatula*, in which the convexity of the upper surface is greatly increased so as to give it an almost conical form, and the pseudopodial perforations obliterated by the free growth of shell-substance. I have recently met with specimens from two or three British localities. *T. refulgens* occurs both fossil and recent, and is not an uncommon form where *Planorbulinæ* abound.

Off Holy Island, 30 to 40 fathoms; rare.

13. ROTALIA, *Lamk.*

1. R. BECCARII, *Linn.* Rotalina Beccarii. Rec. For. Gt. Br. Pl. IV, figs. 90–92.

Common.

2. R. NITIDA, *Will.* Rotalina nitida. Rec. For. Gt. Bt. Pl. IV, figs. 106–108.

Northumberland coast, very rare. Cullercoats, rare; Mr. Alder.

14. PATELLINA, *Will.*

1. P. CORRUGATA, *Will.* Patellina corrugata. Rec. For. Gt. Br. Pl. III, figs. 86–89.

Very rare. Two specimens from dredgings off Holy Island, and a single small one from Berwick Bay, are the only examples of this species which I have met with on our coast.

FAM. NUMMULINIDA.

1. POLYSTOMELLA, *Lamk.*

1. P. CRISPA, *Linn.* Polystomella crispa. Rec. For. Gt. Br. Pl. III, figs. 78–80.

Common.

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2. P. STRIATO-PUNCTATA, *F. & M.* Polystomella umbilicatula; and P. umbilicatula, *var.* incerta. Rec. For. Gt. Br. Pl. III, figs. 81, 82, 82a

Common. Small clear-shelled specimens very abundant in the brackish-water pools of Hylton Dene, near Sunderland; also in brackish water near the mouths of the Wansbeck and Coquet.

2. NONIONINA, *D'Orb.*

1. N. TURGIDA, *Will.* Rotalina turgida. Rec. For. Gt. Br. Pl. IV, figs. 95–97.

Berwick Bay, 30 to 40 fathoms, rare. Off Holy Island, rare.

2. N. UMBILICATULA, *Montagu.* Nonionina Barleeana. Rec. For. Gt. Br. Pl. IV, figs. 68, 69.

Durham coast, 40 to 48 fathoms, rare.

3. N. DEPRESSULA, *W. & J.* Nonionina crassula (page 33); N. umbilicatula (page 97). Rec. For. Gt. Br. Pl. IV, figs. 70, 71.

Found sparingly both in littoral sands and in material dredged from various portions of the coast; common in brackish water at the mouth of the Wansbeck.

4. N. SCAPHA, *F. & M.* [Pl. XII, figs. 10, a.b.]

Two beautiful and well marked specimens of this form, its first occurrence on the British coast, were collected from the sands dredged in 40 to 48 fathoms off Seaham. It is one of the Norwegian species figured by Messrs. Parker and Jones as *Nonionina communis*, D'Orb. (Ann. Mag. Nat. Hist., 2nd Series, vol. XIX, p. 287); but it is also found in the seas of temperate and tropical regions, and occurs in a fossil condition in many Tertiary deposits.

EXPLANATION OF PLATE XII.

Fig. 1. Spiroloculina excavata, *D'Orb.* Magnified 25 diameters.
a. Side view.
b. Edge view.

Fig. 2. Quinqueloculina subrotunda, *Montagu.* Magnified 50 diameters.

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Fig. 3. Lituola Scorpiurus, *Montfort*. Magnified 100 diameters.
Fig. 4. Lagena distoma, *P. & J.* Magnified 75 diameters.
a. Side view.
b. End view.
Fig. 5. Uvigerina irregularis, *nov. spec.* Magnified 65 diameters.
Fig. 6. Textularia complexa, *nov. spec.* Magnified 80 diameters.
a. Side view.
b. End view.
Fig. 7. Bigenerina digitata, *D'Orb.* (Fragment.) Magnified 25 diameters.
Fig. 8. Bolivina punctata, *D'Orb.* Magnified 80 diameters.
a. Side view.
b. Edge view.
Fig. 9. Truncatulina refulgens, *Montfort.* Magnified 30 diameters.
a. Upper surface.
b. Under surface.
c. Side view.
Fig. 10. Nonionina Scapha, *F. & M.* Magnified 100 diameters.
a. Side view.
b. End view.

VI.—*Naturalists' Field Clubs; their Objects and Organization.*

By George S. Brady.

At the time of the establishment of our Club, on the 25th of April, 1846, there existed, I believe, only one similar institution in this country, viz., the Berwickshire Naturalists' Field Club, which began operations so early as 1831, and owed its formation mainly to the zeal and energy of the late Dr. George Johnston, of Berwick. Without wishing in the least degree to under-value the many other associations of a similar character now flourishing through the length and breadth of our islands, I think we may safely assert that these two Northumberland Clubs have been surpassed by none in usefulness and success. And it is quite a legitimate subject of pride to us, that up to this time the only Field Clubs which have published "Transactions" of any recognized scientific value are those of Berwickshire and Tyneside.

But the Clubs with which we have now to maintain a friendly competition—their name is Legion; they are full of energy and

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full of funds—many of them, at least. And they likewise number in their ranks many naturalists of great attainments, whose writings, were they disposed so to bestow them, could not but confer considerable value on any publications in which they appeared. There seems therefore to be no reason why other Clubs, if they chose to do so, should not equal us in the matter of Transactions. I think, therefore, that we should scarcely rest content with merely following year after year the old beaten track. *Stare per antiquas vias* would be scarcely a good motto for a Field Club. The beaten track is a good one, so far as it goes; but the question is whether we may not, with advantage to the chief objects of our Society, occasionally modify and add to the ordinary course of our proceedings in such a way as to promote not only the pleasure of the members, and the prosperity of the Club, but likewise the scientific ends originally contemplated by it.

Let us, in the first place, briefly glance at some of the younger Clubs, and their *modus operandi*. I do not know how many Clubs are at present extant, but I have the names of about twenty, which I fancy are far from forming a complete list. The more important of the societies I have tabulated as follows, arranging them in order of age.

	Date.	Subscription.	No. of Members.
Berwickshire Naturalists' Field Club	1831	6s.	206
Tyneside N. F. C.	1846	5s. 5s. e. f.	522
Cotteswold N. F. C.	1846	10s. 21s. e. f.	94
Warwickshire N. F. C.	1854	3s. 6d.	93
Manchester Field Naturalists' Society	1860	10s. 6d. 10s. 6d. e. f.	About 500.
Liverpool N. F. C.	1860	5s.	633
Bristol Naturalists' Society	1862	5s.	195

The numbers here given apply to June, 1864.

There is considerable diversity in the mode of proceeding adopted by these societies, but they all agree, I believe, in two important respects. They hold no property such as libraries and museums; but they *do* hold field meetings in their respective districts during the months of summer and autumn. The Manchester and Liverpool Clubs include a large number of ladies—

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perhaps about one third or one fourth—and their field arrangements seem to be considerably adapted to the convenience of the fair sex, as regards length of walks, &c. For the same reason, I suppose, it was thought desirable, in one of the circulars of the Liverpool Club sent to me last summer, to state that the "minimum stile gauge" in the course of the afternoon's excursion was one foot. These two Clubs (Manchester and Liverpool) seem to content themselves chiefly with afternoon excursions, starting at one or two oclock and getting tea at five—mostly in some schoolroom or other suitable place lent for the purpose. I need scarcely say that I think our time-honoured course of proceeding, taking the whole day for an excursion, is much preferable to that of the Lancashire men. Neither should I like to see introduced into our programmes the system of giving prizes for the best collections of plants gathered during the day's excursion. In the case of rare species existing only on a very limited area, one can scarcely imagine a better device to ensure their speedy extermination. Moreover, the practice can scarcely promote the good of science in any way that I can see. The study of Nature ought to be and is, to every real student, its own reward, and I should think that such a one will scarcely be found condescending to a competition for a prize of this kind. During a recent visit to Manchester, I learnt from a lady who occasionally attended these meetings, that many rare plants *had* in fact been exterminated by the process referred to.

The Liverpool naturalists try a dredging excursion occasionally for a change, but on board a steamer crowded with a multitude of the curious of both sexes, it is not likely that much serviceable dredging can be done; and such is practically the case, for so far as I can learn, nothing of consequence has been taken on these excursions.

The one point in which the Lancashire Clubs surpass us—and I fear it must be confessed that in this respect we are "nowhere"—is in the magnificence of their Winter Evening Soirees and Conversaziones. But though one can scarcely help looking with a sort of envy on these grand demonstrations, I am, for my own part, very far from wishing that the energy and funds of

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our own Club should be expended in the attempt to do likewise. As to these soirées I did not get much enlightenment from the fair informant previously referred to. She said there was mostly such a dreadful crush that no one could see anything. This probably is the generally received standard of the success of a conversazione, and I suppose that in that respect Manchester can scarcely have surpassed some of our own experiences on a somewhat less ambitious scale.

The objects of Naturalists' Field Clubs (at any rate of *our* Club) may be said to be twofold: *First*, the study of Nature out of doors, and (as being inseparably connected with this) the collection of specimens for more minute examination at home—*secondly*, the preservation of natural objects from wanton or useless destruction. So important has our Club considered this last part of its functions that the longest of its rules is especially devoted to the subject, and enters into it with more minuteness than is usual in such codes. But I am not aware that we have as yet ever seen the way to any concerted action respecting it.

As regards the out-of-doors study of Nature, the chief means which we, as a Club, have adopted, has been that of field meetings, and there seems very little improvement to suggest with respect to them. They are, as all who have attended them well know, very pleasant occasions: even a "juicy" day can scarcely be said usually to throw much of a damp upon the proceedings, and if we could ensure the attendance of those who are bent upon work as well as those who want merely a day's genial relaxation, there would be little left to desire. Our meetings have hitherto been restricted entirely to places within the boundaries of Northumberland and Durham, but we have no rule to that effect; and now that the facilities of railway travelling are so great, there seems to be no valid reason why our rambles should not occasionally be extended to more distant localities. It is true that the country near our doors demands the first attention, and should always—until we have pumped it completely dry—have the main share of it; but we must remember that the boundary lines laid down upon maps have often no existence in Nature, and such is the case, to some extent, in our own region. Moreover, our

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neighbours to the west seem to be in a state of what Dr. Chalmers would have called "brutal ignorance" in the matter of Natural History: they have no such products of advanced civilization as Field Clubs! And why should their fields lie fallow when they are within our reach? There are many places of most tempting beauty and interest just over our borders: why should we not visit them? Think of Saltburn, Rokeby, Alston, Talkin Tarn, Lanercost, Naworth, Yetholm, and many others. It seems to me that it would be a wholesome innovation to allow each year one, at least, of our meetings to be held beyond the limits of the two counties. Though the pursuit of Natural History is avowedly the chief end and object of the field meetings, they certainly answer another and scarcely a less important purpose very admirably. They offer a means of friendly intercourse between those who have the same pursuits and who probably, under other circumstances, might never shake hands together from one year's end to another. There has been of late a good deal of difference of opinion amongst us with respect to the Marsden meeting, which seems to be looked upon as the natural wind-up of the summer's proceedings. The great advantage of the Marsden gathering is the easy accessibility of the place to most of our members: many find their way there who get to none of the other meetings, their interest in the Club is kept up, and though Natural History is generally at a discount, so far as any very abstruse researches are concerned, I believe that very important benefit results to the Club from this great social gathering of its members.

It may not be quite out of the province of a Naturalists' Field Club to exert itself where it can for the promotion of our knowledge of the Natural History of regions far remote from our own, and there is one mode of doing this which we might without much difficulty put in practice. By encouraging the masters of merchant vessels (of which so many sail from our north-eastern ports to all parts of the world) to collect and preserve such objects of Natural History as opportunity brings within their reach, we should doubtless add largely both to our knowledge of the productions of foreign seas, and to the treasures preserved in our museums and private collections. The Literary and Philosophical

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Society of Liverpool has of late exerted itself successfully in this way. By its direction a pamphlet of about fifty pages was printed, and extensively distributed amongst the captains of vessels sailing from Liverpool. The pamphlet contains directions for the capture and preservation of all such organisms as are likely to fall in the way of seafaring men, and though I do not know minutely what the results of this step have been, I have been informed in general terms that the naturalists and the museum of Liverpool have reaped considerable benefit from it. It would certainly appear to be worth while to adopt a similar course of proceeding here. Perhaps a pamphlet of smaller size than that just noticed might be found sufficient, and would of course be proportionally less expensive. And possibly the Natural History Society, as being the owners of the museum, might incur this expense with more propriety than the Field Club. In any case the subject deserves consideration, and I hope may ere long receive it.

Our Club has, I think, done well in according to meteorology a considerable share of attention, and in making the observations recorded by its members and others the subject of an annual report, which year by year increases in comprehensiveness and value. These records of carefully made observations in a district so diversified in its physical aspects as ours, must in the course of time form an invaluable collection of data, and it is much to be desired that every one in the two counties who keeps such memoranda should communicate them to the Club. Many of the more remote districts are yet quite unrepresented in our tables. Besides the practical usefulness of meteorological science, it has great interest for naturalists in the influence exerted by atmospheric conditions in the distribution of plants and animals. And in relation to this part of the subject it may be noted that an exceedingly instructive and little worked field of research is here open to any one who, having sufficient leisure, will take the trouble to become sufficiently well acquainted with our local flora. I refer to the determination of the heights attained by different species on our hills: this, with the aid of a good pocket barometer—now easily attainable—is very easily ascertained,

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and any one contemplating a summer's holiday amongst the Cheviots or other of our upland districts could scarcely employ it more pleasantly or profitably than in a pursuit of this kind. And at the same time, the geological formations affected by different species might also be noticed. The Flora of Northumberland and Durham which we still hope to see produced by Mr. Baker and Dr. Tate, will comprise, not merely a list of plants and their habitats, but an attempt to treat the subject in a philosophical manner with reference to the physical, climatological, and lithological distribution of the various species. Of course, any carefully gathered information bearing upon these subjects will be most acceptable to the authors.

As regards the preservation from destruction of antiquities, objects of natural history, &c., I do not see that, except by the individual influence and example of their members, Clubs like ours have much power in their hands. That there is in many respects great need of some kind of influence being brought to bear cannot admit of a doubt. The constant murder of different kinds of birds under the mistaken name of vermin, and the wholesale pillage of the smaller birds' nests committed by small boys are among the greatest evils of this nature. The first will probably not be much bettered under the present monstrously unjust and barbarous system of game laws. The second would seem to be susceptible of no other remedy than the penal system adopted in France, one which probably would not be very well borne amongst us. It was suggested to me some time ago by the Rev. W. S. Shields, of Warden, that the Club might advantageously circulate among landowners a memorial protesting against the useless slaughter of harmless birds, and pointing out the mistaken ideas under which such a system is kept up. And it seems to be well worth consideration, whether we might not adopt this suggestion.

The extermination of rare plants and ferns is perhaps a smaller evil, but still a grievous one: moreover, it is generally brought about by hands more polite than those of gamekeepers and country lads—perhaps even by members of Field Clubs themselves. It is difficult, too, to speak in general or very sweeping

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terms in condemnation of it, for, when a man wants a fern for his herbarium or his greenhouse, it is hard to say he may not take it. Yet it would be well if we could learn to enjoy and to study more the beauty of these plants in their natural abodes—a beauty far surpassing that which they can ever attain under artificial conditions—and for the sake of this refuse to gratify the destructive or acquisitive tendencies of our nature. There is even some risk of plants once tolerably common becoming rare from the depredations of collectors and nurserymen. A very few years ago in Far Easedale, an unfrequented glen near Grasmere, the banks of the stream were rich with forests of *Osmunda regalis*. Last autumn not a plant of it remained. From the more accessible habitats of Rydal and Grasmere it has long since disappeared, though it once fringed the lakes with luxuriant beauty.

VII.—*Meteorological Report for* 1864. Edited by GEO. CLAYTON ATKINSON, Esq.

(LOCAL OBSERVATIONS FOR 1864.)

MR. G. C. ATKINSON, WYLAM.

January.—Hard frost till 10th; then short frosts and thaws till 20th; afterwards windy open weather till the end. Barometer steady till 20th and declining gradually, then fluctuating till 31st; mean height 28·877 at Literary and Philosophical Society in Newcastle corrected for everything.

February.—A good deal of E. wind, as shown by high clouds overhead; though generally W. in valley; latter part of month calm. Barometer pretty steady; mean height 29·890.

March.—Larks singing on 2nd; apricot in blossom on cold wall on 19th. Cold dull month, with very little sunshine. Barometer fluctuating; mean height 29·695.

April.—Ribes sanguinea in flower on 7th; pear on open wall on 9th; and Sand Martins seen on 9th; black thorn on 17th; and Willow Wren heard 17th. Fine month, though chill winds from N.E. prevailed for the last week. The middle of the month

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was, I think, fourteen days behind the average of the last eight years. Barometer steady; mean height 30·049.

May.—Oak leaf out on 1st; strawberries in garden in flower on 3rd; white-thorn on 16th; Gloire-de-Dijon rose on cold wall on 16th. A fine month; the temperature on the 18th being 81°, which is higher than I remember it in May. Barometer remarkably steady; mean height 30·013.

For many years during May and June, a few Dotterel used to be shot on the Town Moor at Newcastle; calling as it appeared on their way to the Borrowdale mountains to breed. The drainage of the Moor, and other things, have thinned their numbers from year to year. They were usually sold at Mr. Pape's shop. This year, 1864, he tells me he has had none, and in 1863 only one. Ten or twelve years since, I used to buy them of him for 9d. a-piece; but the feathers being much in request for dressing trout-flies, he has sold them of late years, at 2/6 each.

June.—Fine month, with very little variation in the barometer. Roses very fine, and foliage of all kinds luxuriant. Barometer very steady; mean height 30·263.

July.—Very fine month—especially during latter half; the former part being chill with E. wind. Barometer steady; mean height 29·970.

August.—Fine month. Drought much complained of throughout the greater part of England, and on the Continent; it has been dry here, but not exceedingly so. Hay is scanty, but very good and well got in; it is worth £7 per ton. Grouse are fine and pretty abundant; they are selling at 5/ a brace in Newcastle. Salmon has been fairly abundant, and selling, once or twice, as low as 10d. per lb. A great number of grilse have been in the Tyne this summer; very few in 1863. Apples, pears, and apricots, abundant and good. The vicissitudes of temperature this month have been remarkable, ranging between 80° and 31°. Barometer again steady; mean height 30·044.

September.—A fine month, though rain fell on twenty-five days in succession, in very small amount, however. Corn harvest good; wheat harvest better than usual; oats not so abundant. Barometer steady but wavering; mean height 29·817.

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October.—Very fine till 16th, with an exceedingly steady barometer, which fell suddenly on 16th, and fluctuated violently till the 31st. The latter part of the month was wetter than I ever remember; the total amount of rain, (6·67 inches), all fell after the 16th; the amount registered on the morning of 23rd was 1·54, which I think is the largest fall I have known in twenty-four hours, excepting in thunder storms. Mean height of barometer 29·873.

November.—A most singular month as regards the fluctuations of the barometer; two very sudden and violent depressions occurring (on 13th and 18th) without any great amount of local wind or rain; another, commencing on 24th, was succeeded by a S.E. gale on the coast of Northumberland, during which (more however owing to a heavy sea than to the wind) the unfortunate steam ship "Stanley" was wrecked upon the Black Middens, and thirty-nine people drowned. Mean height of barometer 29·696.

December.—A fine month with very steady barometer; the mean height of which was 29·981.

Mr. G. Wailes, Gateshead. Between January 1st and October 18th, 15·53 inches of rain fell; between 19th and 30th October, 7·27; the wettest day was October 27, when 1·99 fell.

Mr. C. H. Cadogan, Brinckburn. July the driest ever known here. The rain in October was all in fifteen days; the greatest quantity in one day being 1·75 inch.

The Rev. J. E. Leefe, Cresswell. Only once since 1856 has so much rain fallen in October, and that was in 1862, when the amount registered was 4·5 inches; the fall in October, 1864, being 4·42.

The Rev. R. F. Wheeler, Whitley. The heaviest fall was on October 29th, when 1·21 fell.

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The Rev. George Iliff, Field House, Sunderland. The fall in October was the heaviest registered by me since 1854; and the heaviest day's fall was on October 23rd, when 1·38 fell.

Mr. J. Wilfred Mounsey, Hendon Hill. Nearly ·75 of rain fell on 22nd October in about thirteen minutes.

GENERAL OBSERVATIONS.

The rainfall in 1864, estimating it by table (27), of returns from six sets of stations feeding the Tyne above Wylam Bridge, was greatly in excess of the average quantity during the six winter months; i.e., from October to March both included; the fall amounting to 20·35 inches; while for the remaining six months, from April to September both included the fall was 9·93, making together 30·28. Had the fall in winter and summer been in the proportion shown by fifteen years' observations at West Denton* and Wylam, this 30 inches would have given 14 for the winter and 16 for the summer half of the year.

The monthly height of the Tyne at Wylam Bridge, is placed in a parallel column (27) to that of the rain, at places supplying it; very little coincidence however exists between them; a fact not to be wondered at when the different circumstances under which rain falls are considered.

Thus the Tynometer was highest on 14th March, when on the melting of the snow the water reached 16·5 feet, and the mean height of the river was also highest (3·83) for the same month; the ground being saturated with moisture, as well as in some measure impenetrable by reason of frost, so that all that fell upon it flowed away immediately into the Tyne; while the great fall in the end of October occurred after a very dry summer, and was in a great measure absorbed by the earth at the time.

Speaking generally, the fall for the year in the districts of our tables did not vary much from the average quantity; some places showing less and some more.

* I use the West Denton observations here merely for the *comparative* amount of rain monthly.

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The quantity which fell in the end of October was extraordinary indeed: Mr. G. J. Symons, who has taken infinite pains with the subject of rainfall in Britain, states that 11 per cent. of the year's fall is the average for October; while (by 27) it will be seen that our per-centage for October was 22 per cent.—just double.

Ranged in order of increase of fall, the following succession presents itself:—

Southern District.....	(2 observations)	22·75 inches.
East Coast.....	(5 „)	24·45 „
Midland District	(8 „)	26·10 „
Northern „	(3 „)	27·44 „
Newcastle „ E.....	(2 „)	28·07 „
„ „ W.....	(3 „)	28·29 „
North Tyne	(1 „)	29·02 „
Coquet Dale.....	(1 „)	29·54 „
Allenheads	(1 „)	43·24 „

As having some reference to this part of the subject, I may mention, that on reducing the level of the great flood of 1771, as marked in the garden of the maister's house at Ovingham, to one of the Ordnance Survey marks at the foot of the Crow Tree Bank closely adjacent, that flood appears to have reached a level of 53·65 feet above the Ordnance datum, i.e., the mean of high and low water at Liverpool.

I had intended to trace the height of that flood above the same datum, at other points; but, finding that the places where any record of its height had been kept, were as far as I could learn, all within the influence of the tide, I have not done so.

Of the wind we have only three returns, which show the mean direction and amount at Seaham, to have been W. 3° S. = 73 p.c.
at Wylam, W. 12° No. 72 „
at Howick, S. 15° W. = 40 „

The remarkably tranquil state of the barometer during April, May, June, July, August, September, and to the 16th October; was attended by an equally undisturbed atmosphere.

In the early part of February there were some high winds, and also after the sudden fall of the barometer on October 16th, though they were not so much felt here, as in other parts of England.

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November, with *exceeding* disturbance of the barometer, had some violent storms; in one of which, on the 24th, the "Stanley" steamer was wrecked on the Black Middens, and thirty-nine lives were lost; but as in October, the violent falls in the barometer were not attended by corresponding disturbance of the air in this neighbourhood.

In December the barometer again steadied, and though the weather was sometimes rather windy, the month was on the whole fine.

Of the barometer, I give the mean of the of the 9 a.m., 3 p.m., and 9 p.m. daily observations (excluding Sundays) at the Literary and Philosophical Society. It will be observed that the mean monthly height for April, May, June, July, and August, is above the average height for the whole year, as might be supposed from the rainless summer we had.

The returns of temperature which have been sent in are even more meagre than last year; which is exceedingly to be regretted. The mean temperature for the year at Wylam, as will be seen by the table, is 46·7; that of seven years under the same circumstances being 47·5; showing 1864 to have been ·08° below the average. There does not seem to be any remark called for as to its distribution. The lowest point to which the thermometer fell at Wylam, was 15° on January 4th and 7th; and the highest was 81·5° on July 19th.

I must not close these circumscribed observations on our local temperature, without calling attention to a remarkable fact elaborately worked out by Mr. Glaisher, from the records of the observations at Greenwich, of nearly a century; and recorded by him in the February Proceedings of the Meteorological Society; to which, as an instance of the ingenious employment of a stupendous collection of observations, and of scientific tact and courage in grappling with them, I must refer my readers.

The facts he deduces are,

1. That our climate in the last 100 years has altered.

2. That the temperature of the year is 2° warmer now than it was 100 years since.

3. That the month of January is 3° warmer.

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4. That the winter months are all much warmer, and every month in the year somewhat warmer than formerly.

There can be no kind of doubt, I think, of the perfect correctness of his deductions, and the soundness of his data; moreover, he proves his figures by the quotation of general memoranda of the weather during the years in question, which corroborate the instrumental records; and I think Mr. Glaisher clearly and incontestably establishes his point.

The only question is, can any local circumstances affect the mean temperature of Greenwich? Is it not possible that a good deal may be due to the increase of smoke and vapour, preventing the radiation of heat; and that even the exceedingly increased traffic and movement on railways on the Thames and neighbourhood may cause an appreciable amount of heat; much of it also created, as it is, by steam power?

If there be no cause of this kind, the fact is indeed a most extraordinary one.

I applied to a very high scientific authority in Paris, to know whether any such change has been observed in France, during the same period; but have received no information.

VIII.—*Climatological Tables relative to Flowering of Plants, &c.*, 1864. Edited by GEORGE S. BRADY.

(1) *Table showing Dates of Budding, &c., of Forest Trees.*

FOREST TREES.	RODDAM.		No. SHIELDS.		SEAHAM.		WHORLTON.		
	In Bud.	In Leaf.	In Leaf.	Divested of leaves	In Bud.	In Leaf.	In Bud.	In Leaf.	Divested of leaves
Alder	.....	.....	.....	.....	Apr. 19	May 12	.....	.....	.....
Ash	Apr. 19	May 19	May 27	.....	Apr. 29	May 16	Apr. 20	May 1	Oct. 28
Beech	Apr. 10	May 10	May 6	.....	Apr. 26	May 3	Apr. 17	Apr. 28	Nov. 1
Birch	.....	.....	.....	.....	Apr. 25	May 2	Apr. 10	Apr. 20	Nov. 1
Elm.....	.....	.....	May 9	Oct. 13	Apr. 1	Apr. 19	.....	.....	.....
Larch	Apr. 8	May 1	.....	.....	Apr. 1	Apr. 11	Apr. 7	Apr. 14	.....
Oak.....	Apr. 20	May 28	May 28	.....	Apr. 12	May 5	Apr. 20	May 8	.....
Poplar	.....	.....	Apr. 14	.....	Apr. 5	Apr. 19	.....	.....	.....
Sycamore ...	Apr. 16	.....	May 6	Oct. 6	Apr. 2	Apr. 18	Apr. 1	Apr. 26	.....

Mrs. Roddam remarks—The forest trees shed their leaves in a very singular manner this season. In many instances the south

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side of the tree was quite bare, while the north side still held its leaves, and some of them quite green.

(2) *Table showing dates of Flowering of Trees and Plants.*

FRUIT TREES, SHRUBS, AND PLANTS.	Roddam.	Stamford-ham.	North Shields.	Sunder-land.	Seaham.	Whorlton.
Apple ... (Standrd. Trees only)	May 18	May 22	May 11	May 11	April 20	May 15
Cherry ... (Standrd. Trees only)	May 4	May 12	April 23	.....	May 1	April 27
Pear ..... (Standrd. Trees only)	May 6	May 17	April 30	April 21	May 1	May 8
Plum..... (Standrd. Trees only)	.....	.....	.....	.....	May 3	May 1
Black Thorn	May 2	.....	April 25	.....	April 29	April 25
Bramble	.....	.....	.....	.....	May 21	June 17
Broom	May 5	.....	May 19	May 24	April 30	May 17
Currant, Black	May 10	.....	May 7	May 3	April 20	April 25
,, Red Flowrng.	April 11	.....	March 31	April 8	March 4	March 30
Elder.....	.....	.....	.....	June 16	June 10	June 16
Gooseberry	April 21	.....	April 13	April 10	March 10	April 1
Hawthorn	June 12	.....	May 23	May 19	May 27	May 25
Hazel	March 22	.....	.....	.....	March 1	March 12
Honeysuckle	May 1	.....	.....	June 24	June 30	June 17
Laburnum	May 20	.....	May 19	May 18	May 17	May 19
Lilac.....	May 24	.....	May 16	May 17	May 17	May 18
Mountain Ash.....	June 1	.....	May 26	.....	June 10	May 21
Privet	.....	.....	.....	July 16	June 4	.....
Rose	.....	.....	.....	June 19	June 1	June 17
Sallow	March 20	.....	.....	.....	Feb. 29	.....
Whin or Furze	April 10	.....	March 23	.....	.....	March 29
Anemone	April 12	April 13	.....	April 17	May 1	April 5
Blue-bell	May 4	.....	.....	.....	April 1	April 20
Coltsfoot	April 1	Feb. 24	Feb. 3	March 16	Feb. 20	.....
Dandelion	April 16	.....	Feb. 17	.....	March 1	April 17
Garlic	May 10	.....	.....	.....	March 30	May 27
Lily of the Valley...	May 16	.....	May 18	May 11	May 20	May 20
Primrose	March 18	April 2	March 30	.....	March 30	April 1
Strawberry, Garden	May 30	May 25	May 10	May 7	.....	May 16
,, Wood...	.....	.....	.....	.....	.....	May 18
Snowdrop.....	Feb. 2	Jan. 27	Jan. 25	.....	Jan. 19	Jan. 25

3) *Dates of the Flowering of the following Wild Plants growing within three miles of Tynemouth*, 1864. By JOHN COPPIN, M.A.

Tussilago farfara	Feb. 3	Viola canina	Apr. 15
Ranunculus ficaria	Feb. 3	Ribes grossularia	Apr. 13
Lamium album	Feb. 17	Prunus spinosus	Apr. 25
Lamium purpureum	Feb. 15	Crataegus oxyacanthus	May 23
Glechoma hederacea	Mar. 31	Trifolium pratense	May 1
Veronica hederifolia	Mar. 14	Ranunculus arvensis	May 2
Veronica chamædrys	Mar. 9	Senecio Jacobœa	July 17
Primula vulgaris	Mar. 30	Centaurea cyanus	July 22
Primula veris	Apr. 13		

(4) *Dates of the Flowering of the following Fruit Trees, Shrubs, and Plants in a Garden at North Shields*, 1864. By JOHN COPPIN, M A.

Gooseberry	Apr. 12	Yellow Auricula	Apr. 12
Red Currant	Apr. 13	Purple Auricula	Apr. 17
Pear Tree (Jargonelle)	Apr. 23	Blue Hyacinth	Apr. 20
Apple Tree (Keswick Codling)	May 4	Lily of the Valley	May 21
Cherry Tree	Apr. 27	Purple Lilac	May 16
Yellow Crocus	Feb. 23	Laburnum	May 19
Purple Crocus	Mar. 2	London Pride	May 13
White Crocus	Mar. 7	Chrysanthemum	Nov. 2

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(5) *Dates of Sowing and Cutting of Cereal Crops, &c.*

GRAIN, &c.	RODDAM.		NO. SHIELDS.
	When sown.	When cut.	When cut.
Barley	March 30	August 16.	August 9
Oats	March 21	August 17.	August 23
Wheat	February 17	September 9	August 23
Hay	.....	July 9	.....
Potatoes	May 2	October 6	.....
Turnips	May 25	October 28	.....

(6) *Dates of Arrival and Departure of Birds.*

MIGRATORY BIRDS.	RODDAM.		STAMFORDHAM		SEAHAM.		NO. SHIELDS.
	Arrival.	Depart.	Arrival.	Depart.	Arrival.	Depart.	Arrival.
Black-cap	.....	.....	.....	.....	May 30	.....	.....
Chiff-chaff	.....	.....	.....	.....	Apr. 18	Oct. 14	.....
Corncrake	May 5	.....	.....	.....	Apr. 29	Nov. 3	May 2
Cuckoo	Apr. 27	.....	.....	.....	May 5	August	April 24
Fieldfare	.....	.....	.....	May 4	Oct. 16	May 1	.....
Flycatcher	.....	.....	June 2	.....	May 10	August	.....
Grey Wagtail	.....	.....	.....	.....	April	Nov. 4	.....
Martin	.....	.....	.....	.....	Apr. 11	Sept.	.....
Norway Crow	.....	.....	.....	.....	Oct. 20	.....	.....
Pied Wagtail	.....	.....	.....	.....	Mar. 18	.....	.....
Redstart	....	.....	Apr. 29	.....	.....	.....	.....
Redwing	.....	.....	.....	.....	Nov.	Jan.	.....
Sedge-warbler	.....	.....	.....	.....	May 1	August	.....
Starling	Mar. 7	.....	.....	.....	.....	.....	March 27
Swift	.....	.....	.....	.....	May 30	July	.....
Swallow	Apr. 21	Oct. 5	Apr. 20	.....	Apr. 29	Oct. 8	April 15
Whitethroat	.....	.....	Apr. 16	.....	May 10	Sept. 28	.....
Woodcock	.....	.....	.....	.....	Oct. 15	.....	October 16
Yellow Wagtail	.....	.....	.....	.....	Mar. 1	Nov. 5	.....

The Rev. J. F. Bigge remarks—Rooks begin to build March 31st; Curlew heard first time March 23rd, Plover March 9th, Thrush and Lark February 1st.

Mr. Draper, of Seaham, writes—Two specimens of the small Willow Wren were seen here for the first time this spring on the 19th April, at 4 P.M., and at 8 A.M. on the 20th not less than fourteen specimens were singing in the woods.

(7) *Dates of First Observation of Insects.*

INSECTS.	Roddam.	Stamford-ham.	North Shields.	Sunder-land.	Seaham.
Small White Butterfly	May 10	May 12	April 13	.....	April 10
Orange Tip	.....	May 18	.....	.....	June 1
Tortoiseshell	April 8	.....	.....	.....	April 20
Brimstone Moth	May 17	June 8	.....	.....	.....
Small Dagger	.....	.....	.....	.....	May 27
Cockchafer	.....	.....	.....	.....	May 27
Hive Bees	March 14	.....	March 18	.....	.....
Humble Bees	April 7	.....	March 25	March 24	.....
Wasps	April 20	.....	April 21	May 3	.....

Mrs. Roddam says—Very few butterflys seen here this season;

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and none of the Brassica tribe of plants attacked by caterpillars, as in previous seasons.

For the observations recorded in these tables, and the preceding Meteorological Report, the Club is indebted to the following contributors:—

Allenheads..... .... Mr. T. J. Bewick, Lead Mines, Allenheads.
Bywell ..... Do. Do. Do.
Bingfield, (Captain Orde) ....
Howick Hall, (Earl Grey) ..... } Communicated by the Rev. J. F. Bigge.
Lilburn Tower, (E. Collingwood, Esq.)
Roddam Hall, (Wm. Roddam, Esq.) ..
Glanton ..... F. J. W. Collingwood, Esq., Glanton Pike, near Alnwick.
Brinckburn ..... C. H. Cadogan, Esq., Brinckburn Priory.
Cresswell ..... Henry Cresswell, Esq., Cresswell, Morpeth.
Darlington..... Mr. John Richardson, Southend.
Gateshead ..... George Wailes, Esq., Burghfield Grange.
Newcastle ..... The Literary and Philosophical Society.
North Shields ..... J. Coppin, Esq., M.A.; J. R. Procter, Esq. (Low Lights); Robert Spence, Esq.
North Tyne ..... Matthew Ridley, Esq., Park End.
Seaham ..... Mr. R. Draper, Seaham Hall Gardens.
Sunderland ..... Rev. George Iliff, Field House; Mrs. Backhouse, West Hendon; J. W. Mounsey, Esq., Hendon Hill.
Stamfordham..... Rev. J. F. Bigge.
Wallsend ..... Mr. J. W. Dees.
Whitley... .... Rev. R. F. Wheeler.
Whittle Dene Water Co... Mr. D. D. Main.
Whorlton, Teesdale ..... T. Dodgson, Esq., Stubb House.
Wylam ..... G. C. Atkinson, Esq., Wylam Hall.

IX.—*Entomological Notes for the Year* 1864. By Thos. John Bold.

The great peculiarity of the past season, 1864, in insect life, in our district, was the extraordinary abundance of such species as are destructive to farm and garden produce. Despite the low temperature, stunted growth of plants, and long continued

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drought, they lived and multiplied to a most injurious extent. Nearly every plant cultivated by the farmer suffered severely by these pests: turnips, wheat, barley, oats, beans, the grasses, and clovers, all being more or less affected and injured.

The crop of turnips in this district was perhaps the worst for many years past, and was still further deteriorated by the attacks of insects. Immense numbers of caterpillars sheltered underneath the bulbs, in which they cut large holes. These appeared to be what are called "surface grubs," and the larvæ of moths, of the genera *Mamestra*, *Agrotis*, *Triphaena*, and *Plusia;* all great pests of the *Brassicæ*. So numerous were these grubs, that a dozen or more would be found near a single turnip. Another destroyer of the turnip was a footless grub, of one quarter to half an inch in length, pointed before and truncate behind, quite white, with jet black mandibles. This, which I take to be a *Dipterous* larva, had eaten into the crown of the turnip, between the leaves, and then directly downwards, forming holes as large as a stout knitting needle; and as from four to a dozen of them would be found in each bulb, they caused sad destruction by admitting air and moisture, which soon caused the turnip to decay. But perhaps the greatest enemies of all were the enormous swarms of *Aphides* which were found on the underside of the turnip leaves, and which, extracting their juices, caused the foliage of whole fields to become yellow. I had some small Swedes brought me for examination, each of which was literally covered by thousands of *Aphides*, and which emitted a most unpleasant odour. I think the species was that described by Curtis, in his "Farm Insects," fig. 68, as *Aphis Rapæ* (known also as the *Aphis vastator*, Smee), and which is very nearly allied to, if indeed it is not identical with, *Aphis humili*, Sch., (Koch, Pflanzenläuse Aphiden, 114, figs. 152–154.) The perfect insects were pretty uniform in colour; but the larvæ, pupæ, and wingless ones, were very variable, being dirty white, yellow, pink, or green, or all intermixed. Hosts of winged males and females were on wing in the last week of September, swarming even in the streets of Newcastle. Under such an accumulation of enemies, one cannot wonder at the general complaints that turnips

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were rotting where they stood; falling over, decaying, and disappearing, "leaving not a wreck behind." One farmer, whose apparently fine crop I was admiring, told me that fully one half of them were so much decayed as to be perfectly worthless, and the other portion lacked their usual solidity.

Wheat, barley, and oats, were very generally infested with the *Siphonophora cerealis*, Kalt., (Koch, l. c. 186, figs. 255, 256, *Aphis Avenæ*, Fabr., Curtis, l. c. 499,) which in its wingless stages varies very much in colour, being green, brown, red, yellow, or nearly white. These were found in great numbers upon the ears of the different species of grain, comfortably located between the grains, out of which they were pumping the vital fluid. In some places they were so numerous, as to interfere with the reaping of the grain. One field of oats was shown me by the farmer, which was so much infested, as seriously to impede the delivery of the reaping machine—the delivering board becoming so clammy with the squashed myriads, that it had to be stopped at short intervals and cleansed. On examining the grain little apparent damage could be seen, but no doubt there would be a percentage less yield per acre; besides which, the chaff and portions of the straw were blackened and clammy with the excrement of the *Aphides*, which would no doubt render them unpalatable to cattle, in itself no small drawback in a season of drought, when all kinds of forage are scarce and dear. The same *Aphis* was found on various species of grass, on which I believe they are generally found, only migrating to other plants when opportunity offers. The stunted second growth of red clover was rendered still more stunted by swarms of another Aphis, (the *Siphonophora pisi*, Kalt., Koch, l. c. 190, figs. 261, 262; *Aphis Viciæ*, Curtis, l. c. 493,) a variously coloured species, and one which feeds upon a great number of plants. This Aphis was so abundant in September amongst clover, that a five minutes' sweep of an insect net would take it by thousands.

Beans perhaps suffered more than any other plant from the presence of the black species, so generally known as the "Cholera fly," [*Aphis Fabæ*, Sapoli, Curtis, l. c. 357, and 428, plate O, figs. 1, 2;] and from its presence alone the crop of beans was

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reduced fully one-half over the district in the vicinity of Newcastle. Long before the beans came to maturity they began to turn black in patches, which might be noticed from a considerable distance, and on a closer examination, these patches were found to consist of plants which had been killed by the *Aphis*. One field, of near twenty acres, which I carefully examined, showed a most astounding amount of insect life. Not one stem was clear of the *Aphis*, whilst some had hundreds, nay, thousands, of the pest upon them; and these were sucked as dry as a piece of wood, were as black as ink, and had not one full pod of beans upon them. When the bean fields of a whole country produce such hosts as are here noted, and when these take wing in still warm days in autumn, they form those astonishing clouds of "Cholera flies" which carry dismay into many minds, who look upon them as the forerunners of pestilence and death. Cabbages in gardens were this year a good deal covered by a mealy looking species, (*Aphis brassicæ*, Linn., Koch, l. c. 149, figs. 203, 204,) which clustered by thousands on the under side of the leaves. Many other plants and trees swarmed with their own particular species, but enough has already been said on a not very attractive class, and we will dismiss the *Aphides*, remarking, however, that numerous also were their enemies: birds, beetles, bugs, the larvæ of flies, spiders, mites, and other things, finding a plentiful supply of food amongst them. I often found the larva of a fly, most likely *Scæva Pyrastri*, amongst the cabbage Aphis, in which they made regular lanes, eating directly forward and through the closely packed masses by which they were often completely covered.

In many of the other orders of insects a great paucity of numbers may be noted; *Coleoptera* (beetles) were far from abundant, those species which feed on plants being more particularly rare, and many of them did not appear until after the rain, which fell towards the middle of September. However, a few additions to the fauna have been made, and these, with the permission of the Club, I will enumerate in another communication.

Earwigs and *grasshoppers* have again become numerous, and the merry chink of the latter was heard all along our sea-banks

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during the summer. No *locusts* however were seen. The order *Hymenoptera* (bees, wasps, &c.,) has not yet recovered, at least in our district, from the effects of the ungenial seasons of 1860 and 1862; *saw-flies*, *sand-wasps*, and *solitary bees* being more especially rare. Of *sand-wasps* I have only seen two species of *Pompilus*; *Mellinus arvensis*, and one single *Pemphredon lugubris* this season; whilst a chance *Halictus*, and two specimens of *Andrena Coitana*, are all the solitary bees that I have taken. Of *Wasps*, great numbers of females were astir in May. Afterwards they became less abundant, and by the autumn became so rare as to be seldom noticed. I am certain that I did not see half-a-dozen of their nests, although I was constantly on the look-out for them. Some of the common species of *Bombus*, such as *B. lucorum*, *lapidarius*, and *hortorum*, are becoming plentiful enough, but all the brown species, which appear to have suffered most from the wet, continue rare; and some other local and less common ones appear to have become extinct.

Lepidoptera [butterflies and moths] were, I think, very few in numbers. I occasionally saw a few common *Whites*, *Meadow-browns*, and *Blues*, but nowhere were they abundant. *Anthrocera Filipendulæ*, however, was exceedingly common on the sea-banks south of Hartley. In all probability *Moths* will be plentiful enough next year, their larvæ, as before noted, being very numerous in turnip fields; and many gardeners are complaining of their superabundance in kitchen gardens, where they are said to have nearly destroyed all the "winter stuff."

In *Homoptera* and *Hemiptera* [frog-hoppers, bugs, &c.] some rather nice species have been met with: one or two of the latter being "new to science," or to the British Fauna. These I hope to record by and by, and I beg to remind our members that I will gladly receive any of this order that they may meet with in their rambles.

Diptera [flies] were only moderately abundant, except in one instance, when I noticed (in September) myriads of a pale gnat-like creature, whose name I don't know, congregated on the top of a wall, which they whitened with their numbers for more than one hundred yards: the object of attraction I could not discover.

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X.—*List of a few Local Homoptera.* By THOMAS JOHN BOLD.

HAVING from time to time taken such Homopterous insects as appeared strange, and having recently acquired names, I am induced, by the novelty of the subject, to lay them before the Club. It must however be borne in mind, that this list is a very imperfect one, as I have only taken things which almost forced themselves into notice, neglecting nearly altogether the small species, such as Eupteryx, amongst which I hope hereafter to reap a rich harvest.

Some of my readers will perhaps say, but what are Homopterous insects? Well, they are little jumping things (the frogs, I think, they must be, of the insect-world), which in their perfect state are commonly called "frog-hoppers," and which are bred in the frothy secretions so common on grass and other plants in summer time, and called by children "Cuckoo's-spit."

The perfect insects are grotesque in form, often brilliantly coloured, and of very active habits. Nevertheless, they have been much neglected by British writers and collectors, principally however from the want of accessible books. This want, I am glad to say, will soon cease to exist. The Rev. T. A. Marshall (to whom I stand indebted for most of the following names,) is most ably describing the British species in the "Entomologist's Monthly Magazine;" and Messrs. Douglass and Scott promise a Monograph as soon as their work on the Hemiptera is published.

1. *Cixius nervosus*, Lin. On trees, amongst herbage, &c.; very common. Northumberland, Durham, and in Cumberland.
2. *C. contaminatus*, Germ. Trees, bushes, &c., &c. Same localities, but less common than the foregoing.
3. *Delphax pellucidus*, Fab. Two females only, taken on the sea coast, near Hartley.
4. *Centrotus cornutus*, Lin. Not uncommon in flowers of broom, and other plants, throughout our district.
5. *Ptyelus lineatus*, Lin. Males and females have occurred abundantly amongst low herbage, especially so on the sea coast.

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6. *P. spumarius*, Lin. Exceedingly abundant everywhere, and very variable in colour. This creature is certainly the most abundant of all our insects. Every plant is covered by the frothy secretions of its larva, and the perfect insect may be seen, in hundreds, seated upon the taller plants, preferring thistles.

7. *Aphrophora Alni*, Lin. A large conspicuous species, found in woods, mostly affecting the birch, and far from rare.

8. *Tettigonia viridis*, Lin. Both sexes of this very pretty insect have been taken at Boldon Flats, where it is somewhat abundant, frequenting low herbage near the water; indeed, it is often found on plants growing in water.

9. *Euacanthus interuptus*, Lin. A common and widely dispersed species, frequenting herbage. I once found it in immense abundance on the hound's-tongue (*Cynoglossum officinale*) at Cambois.

10. *Macropsis Lanio*, Lin. On trees, common. Both sexes taken.

11. *Idiocerus Populi*, Lin. Little Benton and elsewhere; frequents trees, and is not rare.

12. *Pediopsis fruticola*, Fall. On trees; exceedingly common, and very variable in size, and still more so in colour; sometimes of very sober tints, and very often ornamented by brightly contrasted colouring.

13. *Acocephalus rusticus*, Fab. Abounds in grassy places, in Northumberland, Durham, and Cumberland. The females are especially abundant inland, more so than the males; but the latter sex are certainly the most abundant on the sea-banks, especially in autumn.

14. *Ac. bifaciatus*, Lin. Males only have been taken of this pretty insect. I caught one specimen by sweeping herbage in Briar Dene, and two others on a moor in Cumberland, in June.

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15. *Ac. albifrons*, Lin. Males and females. Rather abundant on the sea-banks at South Shields, and in similar places near Whitley and Hartley in August and September.

16. *Ac. rivularis*, Germ. I took a number of both sexes of this species near Hartley, in tufts of grass, in August and September, and near South Shields in October.

17. *Ac. agrestis*, Fall. Amongst grass; abundant everywhere. I found it exceedingly common in the fields near Hartley in October.

18. *Jassus ocellaris*, Fall. Long Benton, August and October.

19. *J. pascuellus*, Fall. Sea-coast near Whitley, and in Cumberland.

20. *J. striatus*, Lin. Whitley and South Shields. Rare.

21. *J. mixtus*, Fab. One specimen only, Jesmond, August.

22. *J. quadrinotatus*, Fab. Long Benton and Gosforth, August and September.

23. *J. prasinus*, Fall. Gosforth, August. Also near Lanercost, Cumberland.

24. *J. subfusculus*, Fall. Abundant at Gosforth, in April; also in Cumberland in June. Affects the birch.

25. *J. sexnotatus*, Fall. One specimen only taken on the borders of Cumberland and Northumberland.

26. *Agallia venosa*, Fall. Exceedingly abundant on the sea-banks, north of Whitley, where it shelters in the grass and plants growing on the margin of the sand.

27. *Megophthalmus scanicus*, Fall., = *pallidipennis*, Curtis, ♀. Same locality as the preceding, and near South Shields. Not rare.

28. *Eupteryx smargadula*, Fall. On trees, &c., Gosforth, but rarely. August.

29. *E. flavescens*, Fab. Little Benton, July.

30. *E. Ulmi*, Lin. Common at Heaton and elsewhere.

31. *E. pulchella*, Fall. Little Benton, but rarely.

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32. *E. aurata*, Lin. Long Benton, Heaton, &c. Common.

33. *E. vittata*, Lin. Near Gilsland, but rare.

34. *Eupteryx Urticae*, Lin. Amongst nettles, abundant.

35. *Dicraneura variata*, Hardy. Tynemouth. Rare.

XI.—*List of Coleopterous Insects added to the Fauna of Northumberland and Durham during the Year* 1864. By THOMAS JOHN BOLD.

1. *Bembidium Mannerheimii*, Sahlb., Erichson, Insecten Deutschlands, I, 740.

Taken at Gosforth in June. I took it also, some years ago, at Tain, in Rosshire.

2. *Ilyobates forticornis*, Boisd. et Lacordaire, Ins. Deutsch., II, 136.

Very rare, only one specimen having occurred, and which was found in a dene west of Hartley, June.

3. *Homalota luridipennis*, Mann., Ins. Deutsch., II, 221.

Long Benton, in May. I have taken it also near Lanercost, in Cumberland.

4. *H. labilis*, Erichs., Ins. Deutsch., II, 226.

North end of Whitley sands, in August.

5. *M. castanipes*, (Kirby,) Steph., *vernacula*, Ins. Deutsch., II, 315.

Also taken on Whitley sands, in July.

6. *Tachinus pallipes*, Grav., Ins. Deutsch., II, 407.

Gosforth and Bothal, in October. Frequents fungi. New to the British Fauna. A specimen or two taken by Mr. Sharp, near Edinburgh, and my own, are the only specimens which have come to my knowledge. They have a great similarity at first sight with *T. rufipes*, but are abundantly distinct; the legs and margins of the thorax being yellow, whilst the armature of the abdomen is very different.

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7. *Lithocharis fuscula*, Mann., Ins. Deutsch., II, 715.

A single specimen, taken beneath a stone, at South Shields, in April.

8. *Stenus Sylvester*, Erichs., E. C. Rye, Entomological Annual, 1865, 55.

"A single specimen, from Northumberland," named by Mr. W. E. Janson, and confirmed by Dr. Kraatz, is in the collection of the former gentleman.

9. *St. debilis*, Erichs., E. C. Rye, Ent. Ann., 1865, 56.

"The original British specimens, in Mr. Waterhouse's cabinet, are supposed to be from Northumberland." It has occurred in several other localities.

10. *Trogophlœus halophilus*, Kies., Rye, Ent. Ann , 1865, 61.

Of this newly detected British species, one specimen only has occurred on Whitley sands. As it has no dorsal grooves on the thorax, it is easily separated from the other species of this genus.

11. *Omalium striatum*, Grav., Ins. Deutsch., II, 1000.

Taken at Gosforth in August, and at Boldon Flats in September, by sweeping rough herbage.

12. *Micropeplus margaritæ*, Jacq. du Val., Rye, Ent. Ann., 1863, 89.

More abundant with us than *M. staphylinoides*, from which it is readily known by its comparatively longer elytra.

13. *Necrophorus microcephalus*, Thomson, Skandinaviens Coleoptera IV, 9.

Mr. G. R. Crotch having drawn my attention to the existence of this species in England, I have examined my local specimens and found one male, which has the characters given by Thomson. It is closely allied to *N. ruspator*, from which it differs in having the trochanters in the male simple; the membranous clypeus of a different shape, with the head less convex, and differently impressed.

14. *Liodes orbicularis*, Herbst., Inst. Deutsch., III, 91.

In fungi, at Gosforth; rare. September.

15. *Epuræa florea*, Er., Ins. Deutsch., 255.

Rare; Whittle Dene. June.

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16. *Rhyzophagus parallelocollis*, Gyll., Sturm, XXII, Pl. CCCXCV, fig. A.

Taken rather plentifully on the railing of All Saints' Cemetery at Jesmond, in June and July. I have met with it on the tombstones in other grave-yards, but can give no reason *why* it is found in such places.

17. *Cryptophagus distinguendus*, Sturm, XVI, Pl. CCCXVI, fig. A.

Newcastle and Long Benton, but rarely. March.

18. *Atomaria fumata*, Erichs., Sturm, XVIII, Pl. CCCXXI, fig. A.

New to the British Fauna. Taken in some plenty in fungi at Gosforth in September and October. The majority of my specimens are much darker in colour than Sturm's figure.

19. *Melolantha Hippocastani*, Fab., Ins. Deutsch., III, 673.

I have possessed for many years two specimens of Melolantha, male and female, in which the anal style is totally wanting. These I recently submitted to Mr. Waterhouse, who thinks them to be extraordinary varieties of *M. Hippocastani*. One, the female, was taken at Long Benton, the male in Cumberland.

20. *Aphodius lividus*, Oliv., Ins. Deutsch., III, 837.

Very rare; Heaton. July.

21. *Cyphon ochraceus*, Steph.

Rarely at Long Benton. June.

22. *Telephorus figuratus*, Mann., Rye, Ent., Ann., 1865, 71.

This recently detected species is not uncommon in our district.

23. *Telephorus fuscicornis*, Oliv., Ins. Deutsch., IV, 511. (Cantharis).

Whittle Dene, but not common. June.

24. *Alexia pilifera*, Müll., Steph.

Also from Whittle Dene. June.

25. *Monotoma sub-4-foveolata*, Waterhouse.

I took one specimen near South Shields, which is, I think, the above species.

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XII.—*Miscellaneous Notices and Observations.*

Note on Hemiptera.—Amongst the Hemipterous insects [bugs] taken last year (1864), a few are of sufficient interest to be recorded. *Macrocoleus Paykuli*, and *Calocoris Chenopodii*, occurred in profusion at the north end of Whitley sands, frequenting the Rest-harrow (*Ononis arvensis*). *Orthosteira obscurus* was also taken, but more rarely. By sweeping the dyers-weed (*Genista tinctoria*) which grows profusely in Briar Dene, near Hartley, I got the rare *Heterocordylus unicolor* and *Homodemus ferrugatus*, the latter in profusion. *Monalocoris Filicis* was found amongst grass in the same place. At Long Benton I met with *Matthacus rufifrons*, *Plagiognathus arbustorum*, *Harpocera thoracica*, *Orthops Kalmi*, *Lygus contaminatus*, *Leptopterna ferrugatus*, *Scolopostethus contractus*, and *Drymus sylvaticus*. New to the British Fauna is *Cyrtorhinus elegantulus*, which was taken at Boldon flats, in September. *Phytocoris distinctus*, a very pretty thing, and new to science, was beat out of bushes at Gosforth in September. Gosforth has also produced *Phylus melanocephalus*, *Aprocnemus variabilis*, *A. ambiguus*, *Stygnus sabulosus*, and *Drymus brunneus*. The last lives amongst the dead leaves in the water-courses, and is abundant. I found it in similar places at Gibside. *Licocoris ericetorum* was taken at Scaffold Hill so late as October. The very rare *Stiphrosoma leucocephala* was swept out of rough herbage near Heaton. Finally, a good Salda (*ocellata*, Curtis) was taken near Axwell Park. I had previously taken it in the river Irthing, in Cumberland.—*Thomas John Bold, Long Benton, February* 22, 1865.

New localities for rare or local Coleoptera.—A narrow deep dene, west of Hartley, produced me some good beetles, such as *Ocalea badia*, *Leptusa ruficollis*, *Homalota laticollis*, *Quedius humeralis*, *Colon brunneus*, *Triphyllus suturalis*, and others of less note. From Gosforth I have *Ilyobates nigricollis*, *Quedius ruficollis*, *Quedius fuscipes*, *Colenis dentipes*, *Agathidium seminulum*, *Pachyrhinus canaliculatus*, and *Thyamis anchusæ*. Near Whitley was found, in some plenty, *Stenus atratulus*, *Crypthopypnus quadripustulatus*, and *Thyammis suturalis*. Heaton produced me *Homalota laticollis*, and *clientula*; also, *Lathridius nodifer*. Gibside

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adds *Quedius lateralis*, *Ilyobates nigricollis*, and *Scaphidium quadrimaculatum*. From Whittle Dene are *Agathidium nigripenne*, and *Brachypterus pubescens*. The rare *Philonthus micans* was taken at Boldon Flats, in September. *Ptilinus pectinicornis* occurred at Long Benton. *Alphitobius piceus* was brought to me from Seghill colliery, where it swarms in the underground stables, at the foot of the shaft. *Blaps mucronata* is another subterranean dweller, and abounds in many of our deepest pits. At Durham, amongst a cloud of good things taken by the Rev. R. Kirwood, is *Byturus fumatus*, *Ptilinus pectinicornis*, and *Xyloterus domesticus*.—*Ibid.*

Notices of Rare Plants.—Besides the *Rosa rubiginosa* and the *Trifolium ochroleucum*, previously mentioned, I have detected the following plants near Seaton this summer:—*Trifolium scabrum* in a sandy grass-field near the Tees bay. Also in a large meadow, near the last spot, several fine plants of the Lucerne—*Medicago sativa;* the field is sandy, and far from any garden or house.

The following plants I gathered in the ballast, chiefly chalk, to the North of Old Hartlepool:—One fine plant of Saintfoin, *Onobrychis sativa* and two or three plants of *Astragalus glyciphyllus*. The latter plant is not given in Mr. Lawson's notes of the "Flora of the Hartlepool Ballast Hills," published in Vol. V, Part IV, of the Trans. Tynes. Nat. Field Club.

The following species were found on the ballast (mostly chalk) near to West Hartlepool, south of the town. A single plant of *Blitum virgatum*, or Strawberry Blite, not a native, but from Spain; South Europe, &c.—not in Lawson's list. A handsome white flowered plant, which is rare, and not in Lawson's list, is *Lepidium Draba*. Nor is it in Smith's English Flora. Three or four plants of it I found in the West Hartlepool ballast. *Vicia Bobartii*, a beautiful crimson-flowered delicate vetch, on the chalk ballast, West Hartlepool—a few plants: not given in Lawson's paper.

I should also mention that *Trifolium ochroleucum*, *Astragalus glyciphyllus*, *Blitum virgatum*, *Lepidium Draba*, and *Vicia Boburtii*, are *not* included in Mr. Norman's paper on South Durham

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Ballast Hills Botany, published in Trans. Tynes. Nat. Field Club, Vol. V, Part II.—*John Hogg, F.R.S., Aug.* 4, 1864.

On Water Shrews.—On November 6th, as I was walking between Norton and Billingham, I found near the rivulet on the Billingham side a dead Shrew-mouse, which had been recently killed. At first I concluded that it was *Sorex fodiens*, the Water-shrew, which I had once before, viz., on October 22nd, 1832, seen in this vicinity. The specimen I then noticed was swimming swiftly in a pool of water, but I was unable to capture it. The animal I found last Sunday, on examination, clearly differs from *S. fodiens* in being more black on the back, its belly not a clear white, and not having the lines of separation of those colours strongly marked on the sides. I find indeed the specimen to be *S. remifer*, the "Oared Shrew." Its hind feet are larger than the *S. fodiens*, and are edged with stronger hairs or *cilia*, which are of much assistance to it in swimming. The tail, too, differs in being square at the base, and flattened at the tip. The colour on the throat and breast is chestnut, or brown-yellow. Its snout is not so sharp as that of the former and more common species, and it is more flattened. Its body also seems somewhat thicker.

In this neighbourhood both the Water Shrew and the Oared Shrew are extremely rare, for I have only seen one of each species; and having for full forty years been a shooter, frequenting our ditches and rivulets for snipes and water birds, I have never met with these aquatic Shrews but on the occasions here mentioned. I am inclined to think that the Water Shrews are abroad chiefly late in the evening, and perhaps at night, and so probably escape the notice of most observers. They are very pretty and interesting little animals; and their habits, &c., require to be more carefully investigated.—*Ibid, Nov.* 9, 1864.

Note on Lathyrus grandiflorus, (Sims.)—Having this last autumn found one of the many plants of this beautiful *Lathyrus*, or *Vetchling*, (which have grown in my garden here, for very many years,) bearing a pod, with seeds in it, and as no one has ever

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yet described the latter, I beg to send the specimen and this brief account to the Naturalists' Field Club.

This large-flowered Vetchling, although devoid of the perfume of our common Sweet Pea, bears much larger, more beautiful, and more deeply coloured flowers than the last species; it is very hardy; having a perennial root, it is a lasting acquisition to the garden; with me it creeps up bushes and shrubs, and has become nearly wild. I could, however, detect only one pod on the numerous plants which I possess in different sites; and the fact of one having matured its seed was, I conclude, owing to the dry and fine summer of 1864.

The species is figured in Vol. XLIV of Curtis's "Botanical Magazine," edited by Dr. Sims, 1817, tab. 1938. The Editor says that its "native country is uncertain, probably Italy or Sicily;" and he states that "it has not as yet produced any seeds, though it has flowered two summers." Nine years afterwards, in May, 1826, I gathered some fine specimens of this species in some small copses on the lower slopes of Mount Etna, which I have recorded in my "Catalogue of Sicilian Plants," published in the "Annals and Mag. of Nat. Hist., Vol. X, p. 320, 1842.

Dr. Gussone, in his "Floræ Siculæ Prodromus," Vol. II, published two years after my visit to that island, describes (p. 413) the pod, or legumen, as "rectum, 3 lin. latum, 2–2½ poll. longum;" but he adds, "semina matura non vidi."—*Ibid, Norton, Feb.* 9, 1865.

Marine Algæ.—The following species of algæ not previously noticed in our district have been found, chiefly amongst rejectamenta of the sea, on the Northumberland Coast, near Blyth. They are now in the possession of Mr. W. H. Brown, of North Shields. *Polysiphonia elongella*, Harv.; *Calliblepharis jubata*, Kutz.; *Lomentaria ovalis*, Endl.; *Griffithsia secundiflora*, J. Ag. —*George S. Brady, Sunderland, Feb.*, 1865.

[*Note to the Dredging Report.*—In the description of the new species of *Cythere* reference is made to certain MS. names in the *Report of the British Association* for 1864, which are here

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superseded. The names thus referred to are those used by the Author when his paper was read at the Bath Meeting; but since the present (Tynes. Nat. Field Club) Report has been in type he has had an opportunity (which was not anticipated) of changing the names in the British Association Report. These therefore have now been brought into conformity with the titles here adopted, and it will thus be unnecessary for future writers to take any notice of the MS. names referred to.—*A. M. Norman, June* 28, 1865.]

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THE NINETEENTH ANNIVERSARY MEETING

OF THE

TYNESIDE NATURALISTS' FIELD CLUB

Was held on the sixth of April, 1865, when an address was read by the President, the Rev. George Cooper Abbes, M.A.*

The Treasurer's report was read and adopted.

The following gentlemen were elected officers for the year 1865–6:—

PRESIDENT.

The Rev. Alfred Merle Norman, M.A.

VICE-PRESIDENTS.

A. Hancock, Esq. F.L.S.	Rev. Angus Bethune, M.A.
R. S. Newall, Esq., F.R.A.S.	E. C. Robson, Esq.

Ralph Carr, Esq.	Rowland Burdon, Esq.
Rev. J. F. Bigge, M.A.	J. Hogg, Esq., M.A., F.R.S.
Joshua Alder, Esq.	Rev. H. B. Tristram, M.A.
D. Embleton, Esq., M.D.	George Wailes, Esq.
R. Ingham, Esq., M.P.	Rev. W. Greenwell, M.A.
Sir W. C. Trevelyan, Bart.	Edward Charlton, Esq., M.D.
T. Sopwith, Esq., F.R.S.	Rev. G. C. Abbes, M.A.

TREASURER.

Robert Y. Green.

SECRETARIES.

George S. Brady. | Thomas Thompson.

G. H. Philipson, M.D.

Shields, W. H. Brown.	*Hexham*, Rev. W. T. Shields.
Durham, John Booth.	*Morpeth*, W. Creighton.

* Mr. Abbes's address being not yet ready for the printer, the publication of it is deferred.

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COMMITTEE.

Joseph Blacklock.	James W. Dees.
R. B. Bowman.	William Dinning.
H. B. Brady, F.L.S.	John Hancock.
E. J. J. Browell.	Richard Howse.
James Clephan.	G. C. Pecket, Jun.
John Daglish.	John Thompson.

AUDITORS.

Henry Turner. | J. S. Foster.

The Field-meetings for the ensuing year were fixed as follows:—

MAY..... Hartford Bridge.
JUNE ..... Naworth and Lanercost; Talkin Tarn and Tindale Fells.
JULY ..... Wark and Blackaburn.
AUGUST ..... Lartington and Deepdale.
SEPTEMBER ..... Knarsdale and Snowhope Burn.
OCTOBER ..... Marsden.

The following gentlemen were elected members of the Tyne-side Naturalists' Field Club during the year 1864–5:—

At the ANNIVERSARY MEETING:—Messrs. James Davidson, John Reed, John Harkass, Mason Watson, John Mather, Frederic Robson, Newcastle; Charles Bass, Gateshead; Robert H. Gayner, Sunderland; Thos. McClarence, South Shields; Wm. Hodgson, Hartlepool; Rev. F. B. Thompson, Benfieldside.

At the FIRST FIELD MEETING:—Messrs. Edward Benning, Riding Mill; Joseph Hutchinson, Durham; W. T. Wailes, Thos. Belt, Newcastle; G. C. Pecket, Jun., Robert Elwen, William

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Kelman, Jas. Hills, Sunderland; Jas. I'anson, Jun., Darlington; W. N. Taylor, Ryhope; Rev. Joseph Shooter, North Shields.

At the Second Field Meeting:—Messrs. Thomas F. Hedley, Sunderland; E. M. Bainbridge, Newcastle; William Kimpster, Thomas W. Dance, Gateshead.

At the Third Field Meeting:—Messrs. Thos. Ranson, W. A. Oliver, Sunderland; Charles G. Grey, Dilston; W. H. Holmes, Gateshead; John Glover, Newcastle; Henry Wilson, South Shields.

At the Fourth Field Meeting:—Messrs. William Pearson, Walter Bowman, William Dickinson, John Glendinning, Newcastle; Colin Smart, Sunderland; W. C. Blackett, Durham; F. Widowfield, Houghton-le-Spring; T. J. Dawson, Haswell Colliery.

At the Fifth Field Meeting:—Messrs. Thomas Carr, Oliver Young, William Pearson, Newcastle; William Pearse, Fenham Hall; John C. Lord, George Shiel, Sunderland.

At the Sixth Field Meeting:—Messrs. Wm. L. Robertson, F. T. Wareham, John Wood, Rev. S. F. Cresswell, Durham; G. S. Moore, Sunderland; Rev. G. E. Green, Boldon; Rev. E. Healy, Bishop Auckland.

At the First Evening Meeting:—Messrs. James Douglas, Winlaton; W. T. Moor, Newcastle; John A. Harrison, Thornley House.

At the Second Evening Meeting:—Messrs. Jos. Watson, Jun., Gateshead; Richard Nichol, Newcastle.

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THE TREASURER IN ACCOUNT WITH THE TYNESIDE NATURALISTS' FIELD CLUB.

Dr.				Cr.			
1864.				1864.			
To Balance	£33	11	8	By Printing of Transactions, &c.	£102	14	3
,, Subscriptions, Entrance Fees, &c.	136	9	9	,, Printing and distributing Circulars, &c.	30	13	11
,, Photographic Society	5	0	0	,, Mr. Forrest, Commission, &c.	9	15	11
				,, Dredging Expedition	5	0	0
				,, Expenses at Field Meetings	4	2	3
				,, Sundries	9	2	6
				1864.			
				Balance	13	12	7
	£175	1	5		£175	1	5

Examined and found correct,

HENRY TURNER, AUDITOR.

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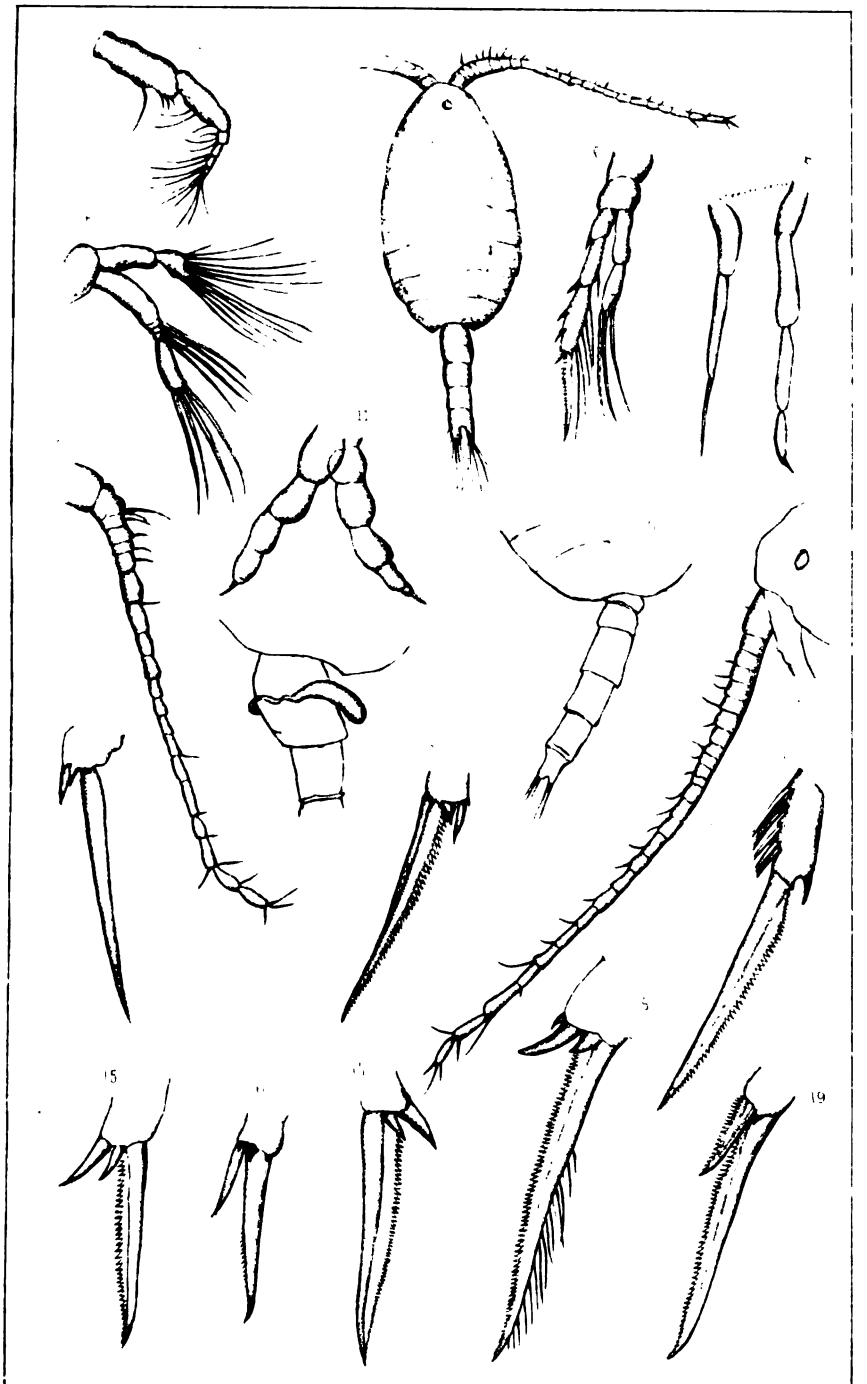

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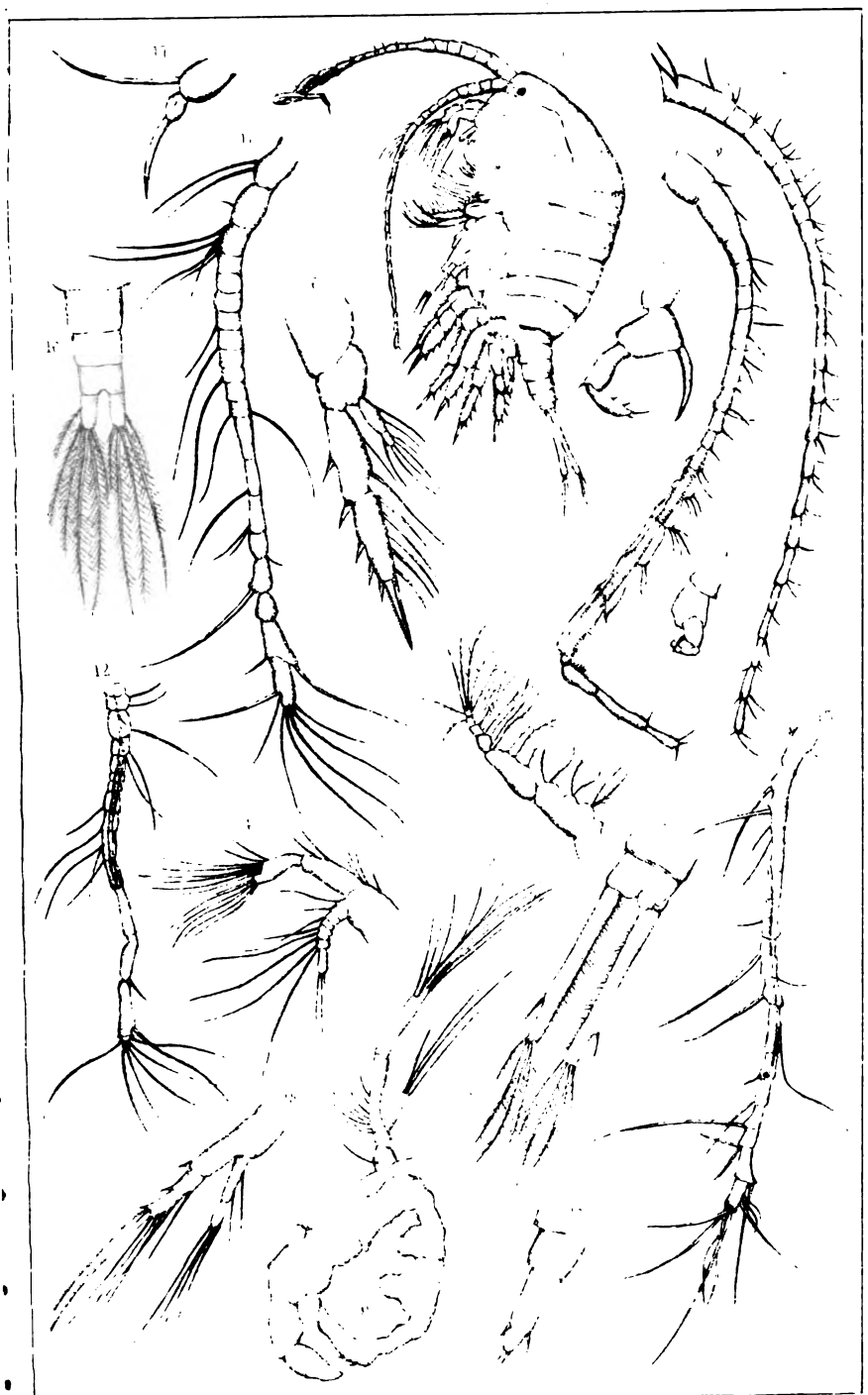

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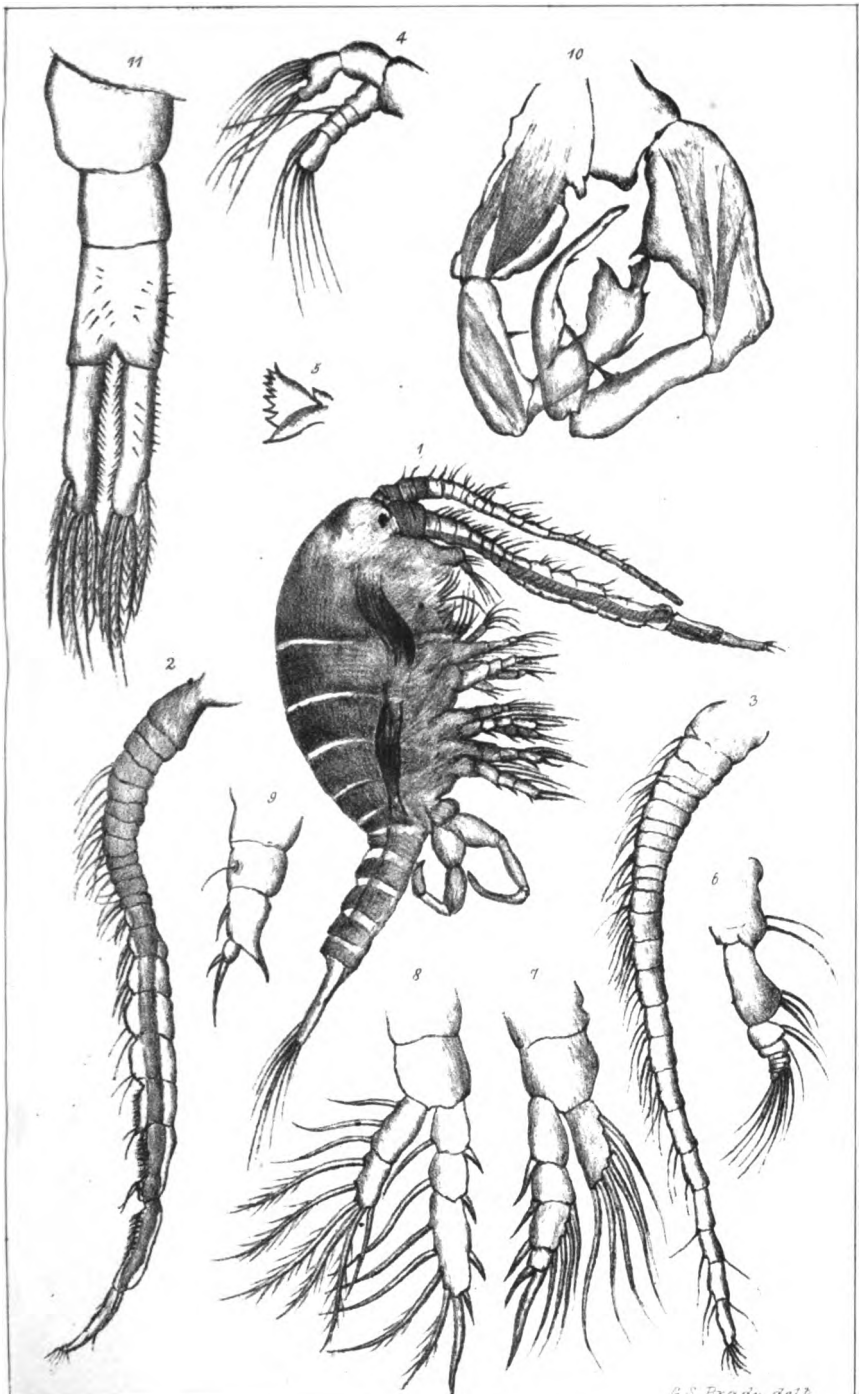

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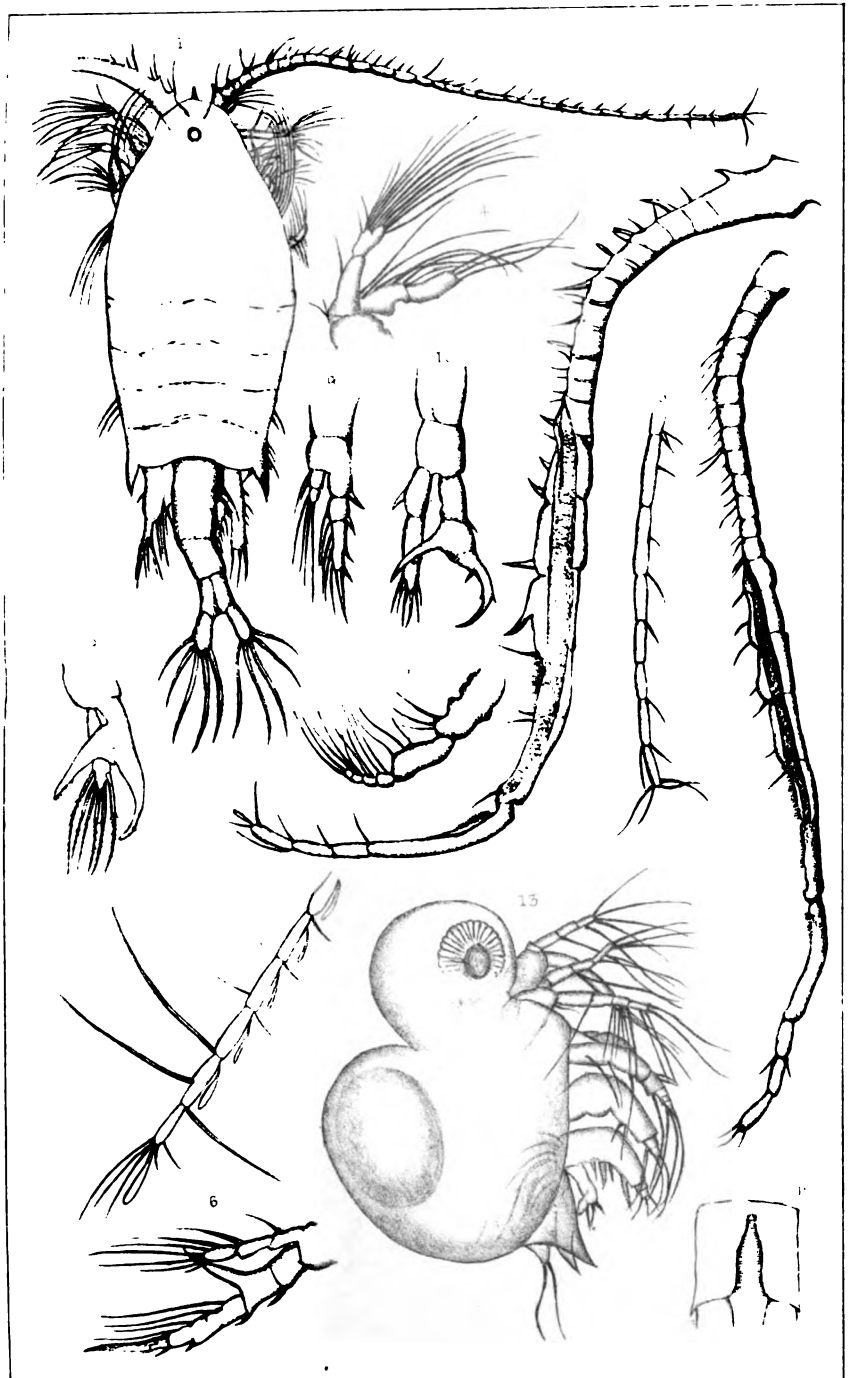

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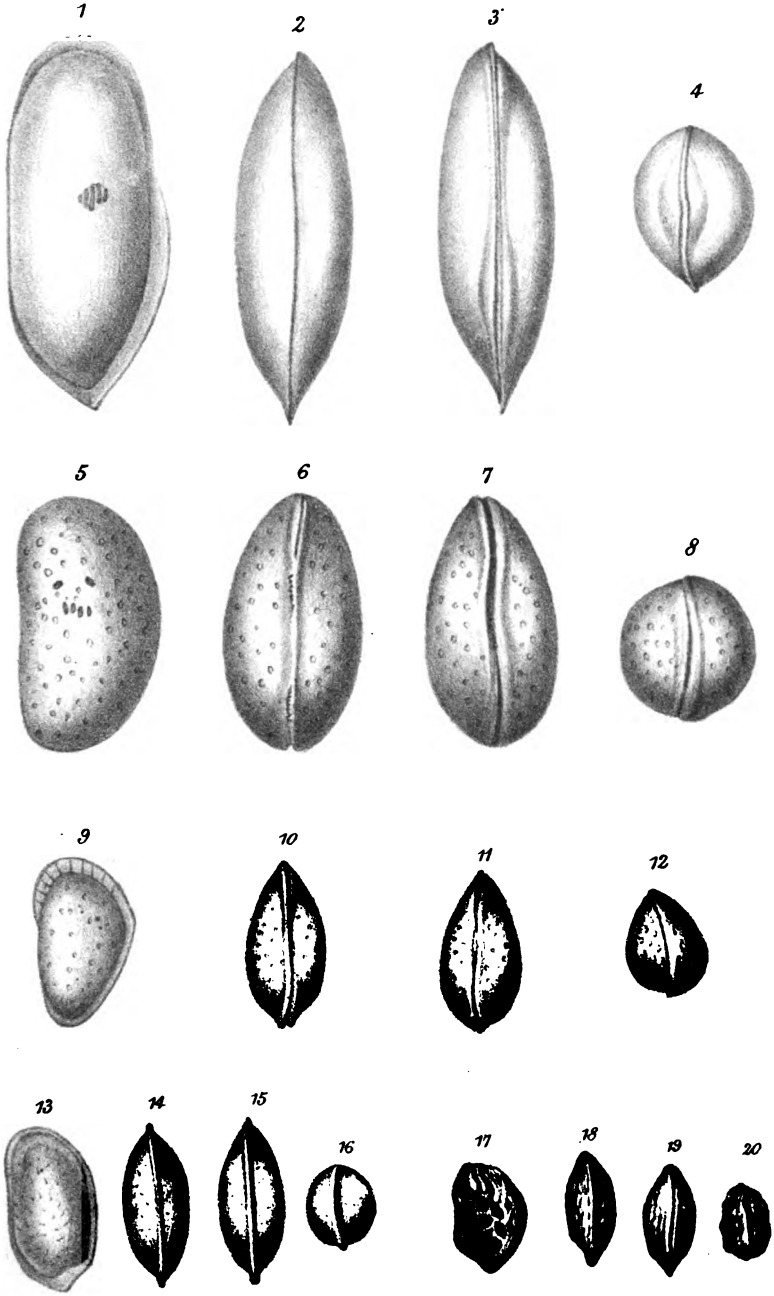

G.S. Brady del. T. West lith.

W. West imp.

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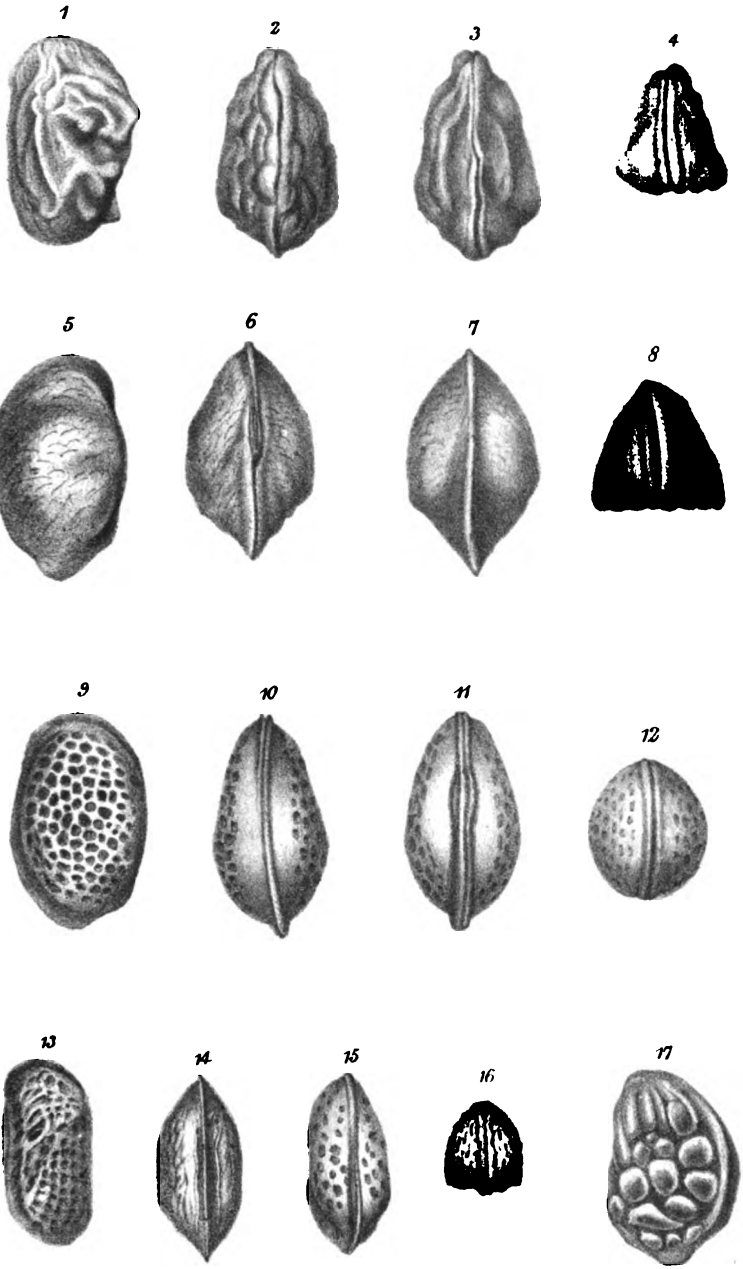

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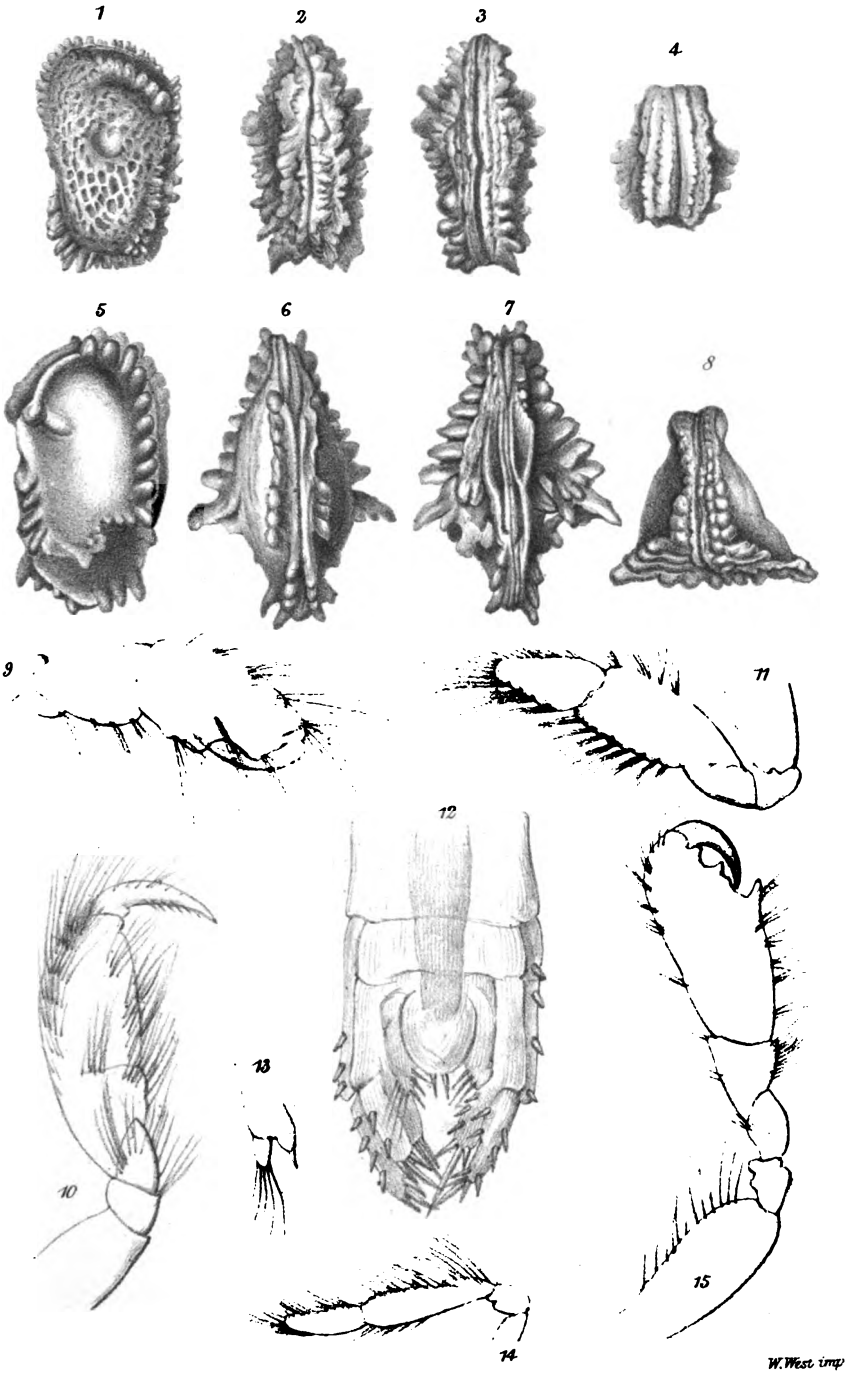

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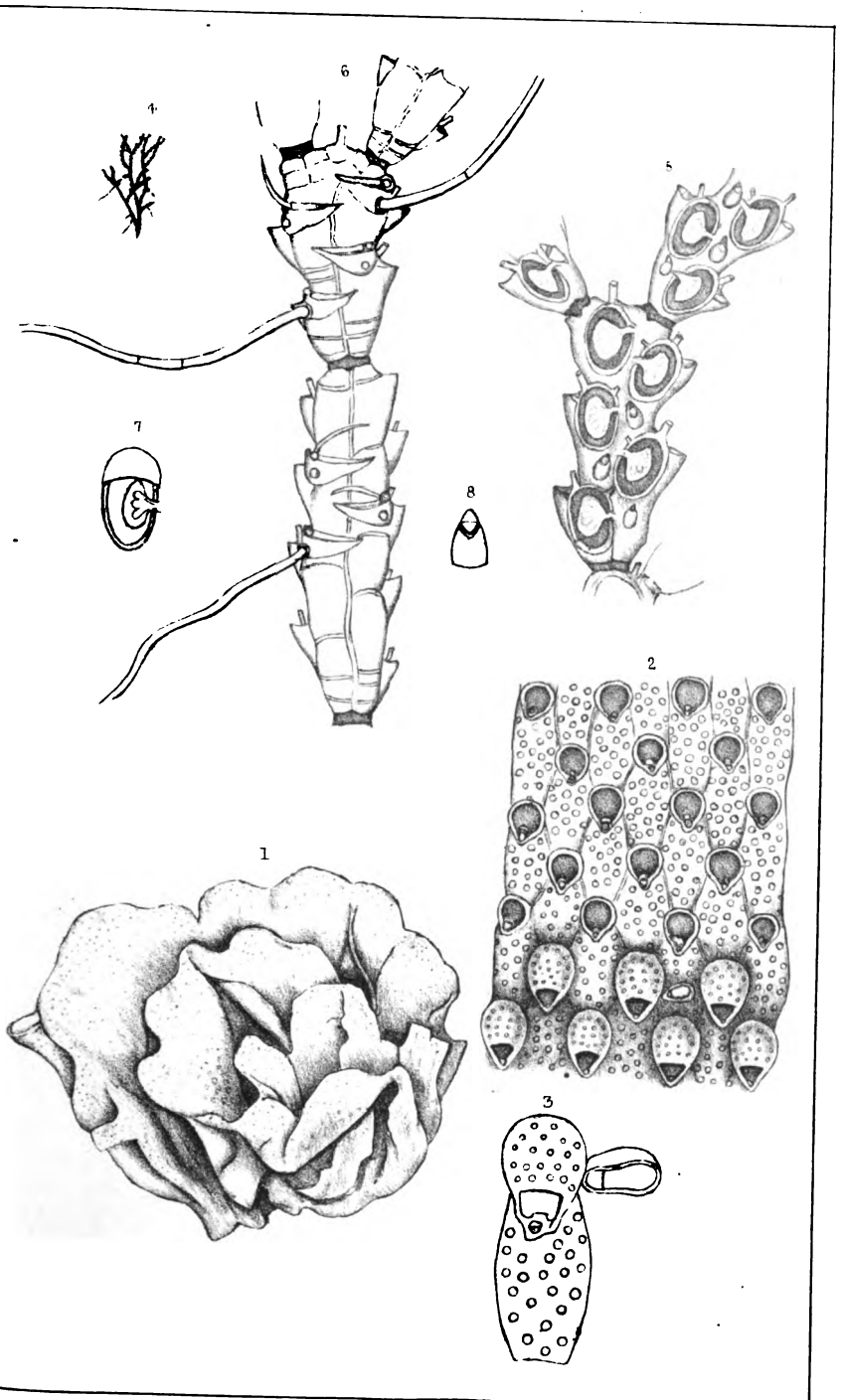

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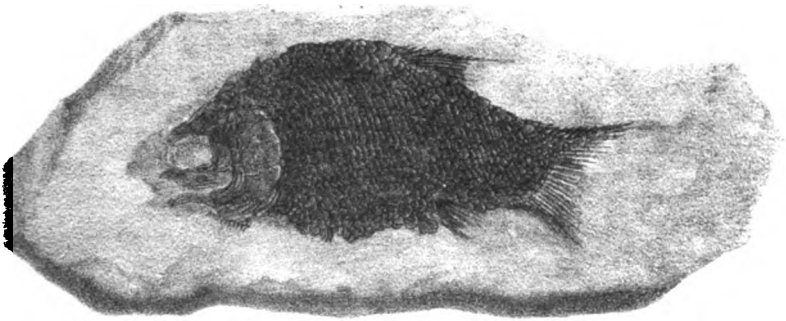

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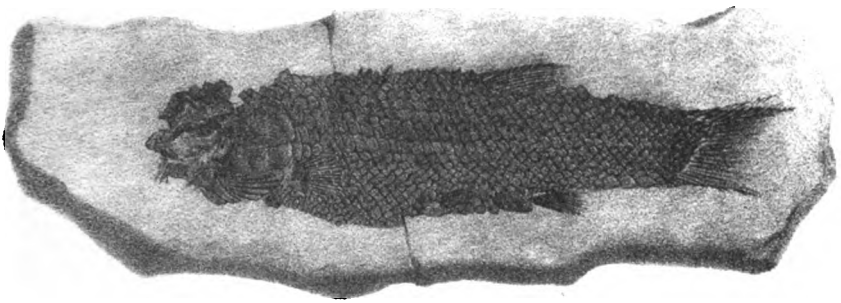

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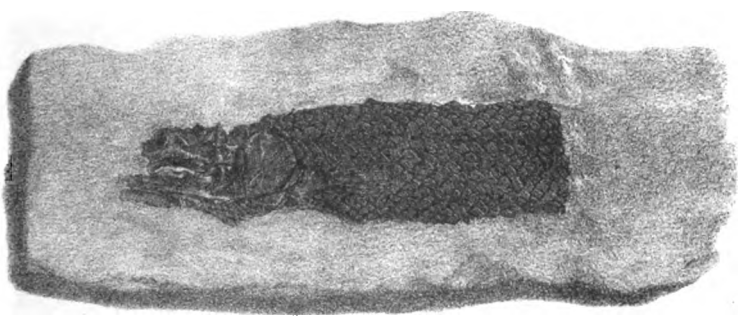

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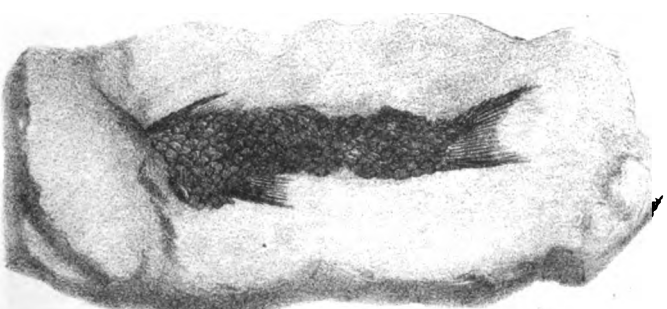

3.b.

[illegible] Vincent Brooks Day & Son lith.

W. & N. Hanhart imp.

PERMIAN FISHES

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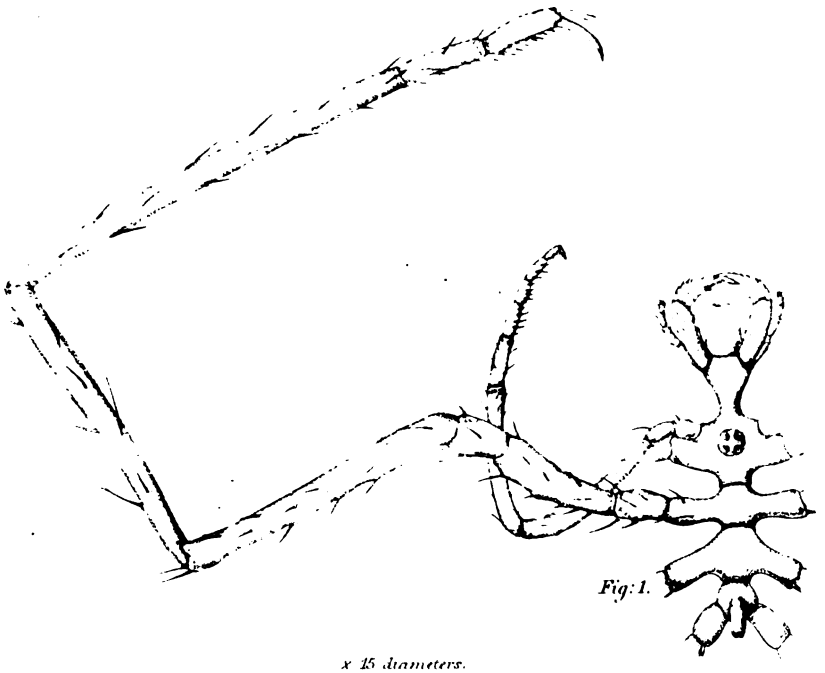
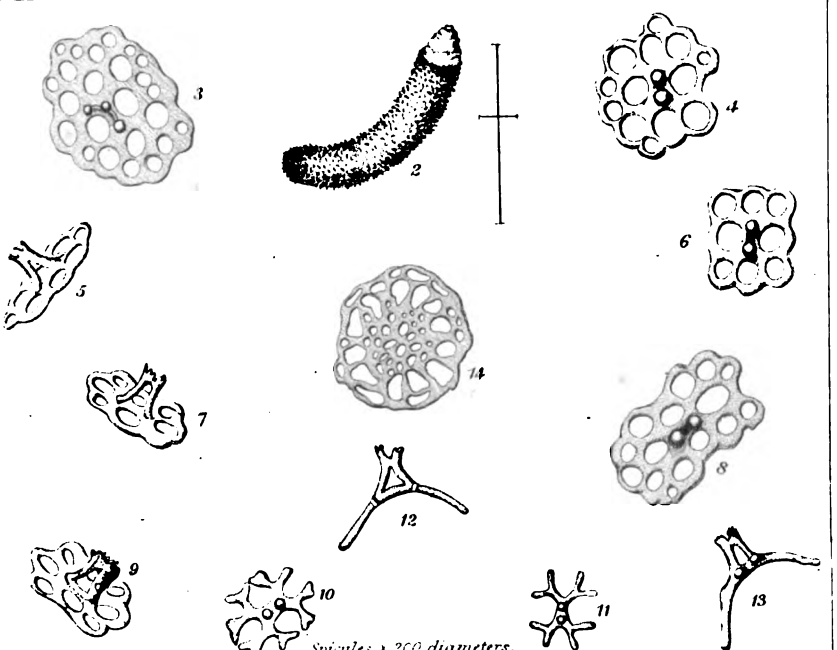


Fig: 1.

x 15 diameters.



Spicules x 200 diameters.

W. H. Fry. del. T.West. sc.

W. West. imp.

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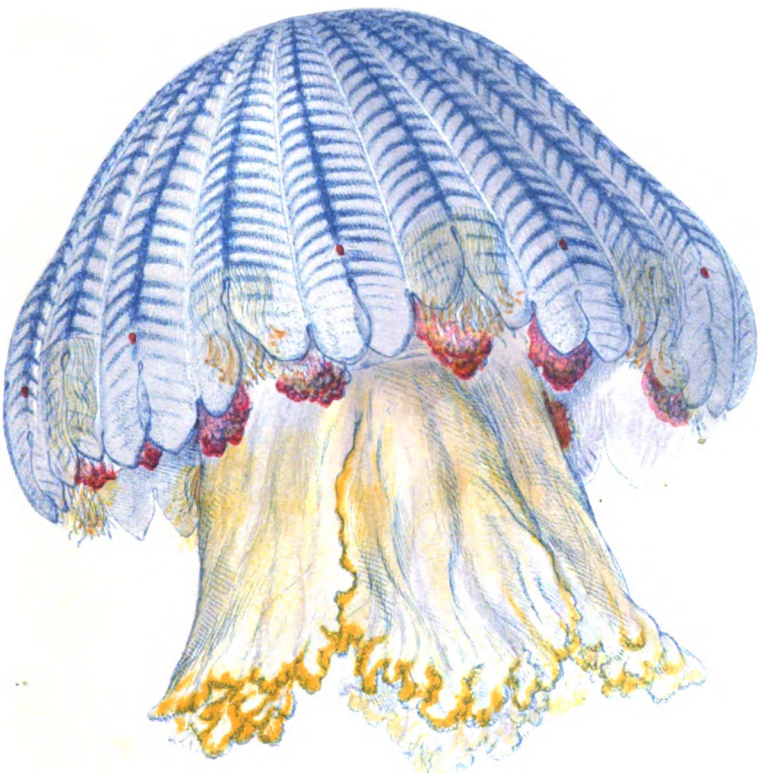

T. West del. & chromo.

W.West imp.

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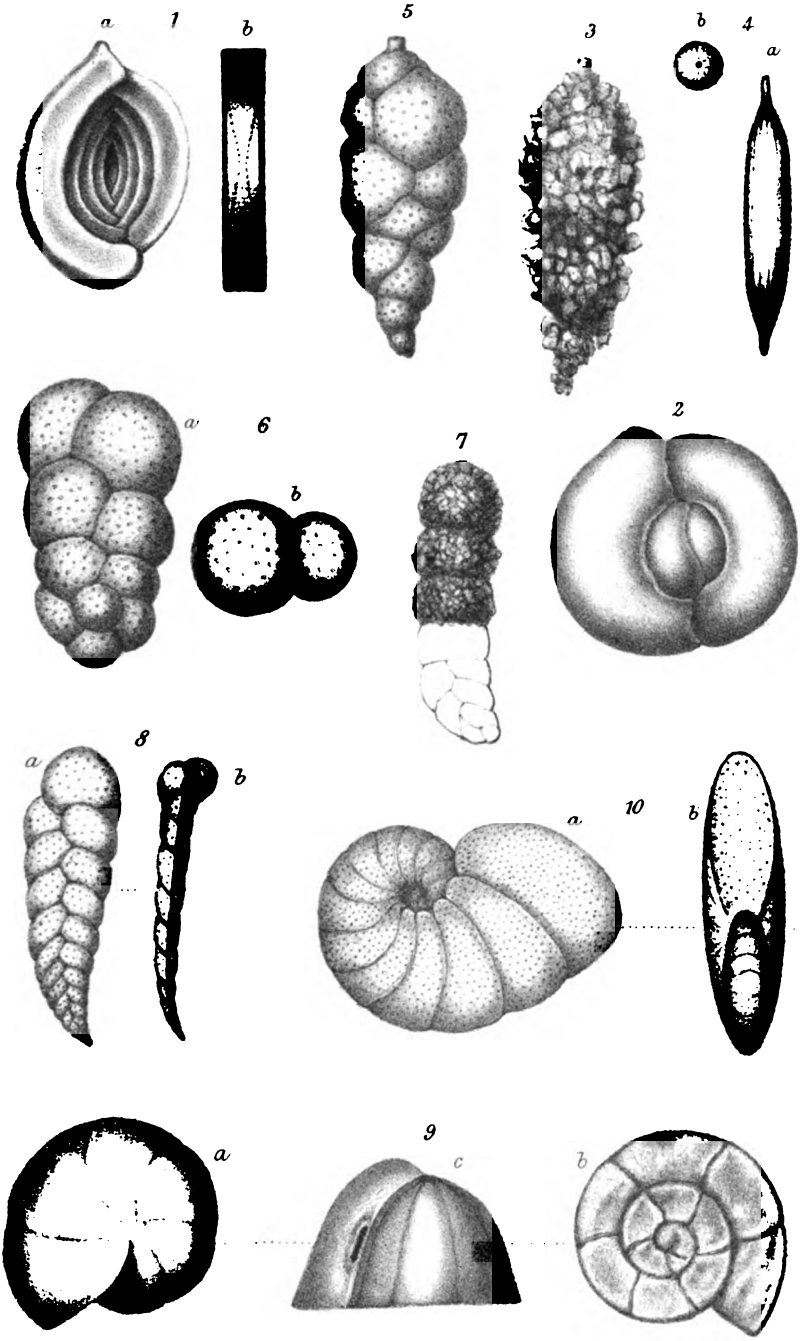

H.B. Brady ad. nat. del. T. West lith.

W. West imp.

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Part ii. iii. 1866. 1867.

XIII.—*On an Ancient British Burial at Ilderton, Northumberland, with Notes on the Skull.* By the Rev. W. Greenwell, M.A., and D. Embleton, M.D. (Plates XIII, XIV.)

The district where the discovery was made, an account of which is now laid before our Society, is one peculiarly rich in various remains of the tribes which occupied Northumberland, before and at the time of the Roman invasion. Fortified places are found upon almost every hill end. At Old Bewick, close to the fine camp there, is a rock, covered with the circular markings—mysterious symbols, which have as yet eluded any solution of their meaning; whilst, from time to time, numerous discoveries of burials, both of burnt and unburnt bodies, associated, in many cases, with sepulchral urns and other articles, testify to the large population, which, in former ages, dwelt along the fertile valley of the Till. After an examination of many places of sepulture of British times, and from a careful study of this subject, we may come, without much doubt, to the conclusion, that, as a rule, during the later British times, the ordinary mode of interment was by inhumation. In the earlier* part of the bronze period the body was usually burnt, the bones being then enclosed in an urn, a small cist, or a circular hollow sunk in the natural surface of the ground, or simply placed upon the ground, in each of these cases a barrow being afterwards raised over the remains. But though this was the ordinary mode, burials by inhumation are found so intimately associated with burnt bodies as to prove that both modes were sometimes practised at the same period, and by the same tribe. The reason of these diverse manners of burial is at present unknown, but it is quite possible that, by further examination, we may be able to arrive at some just conclusion on the point. Burial after cremation seems to have been replaced, in the main, by burial by inhumation, a practice which

* There is reason to suppose that, before the period during which the body was burnt, there was an earlier one, when the body was interred in the flesh; but it is most probable that this was practised by a different race, to whom the use of metal was unknown.

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continued down, through the time of the introduction of iron* into Britain, until the Roman occupation, and no doubt also during that period; for though the Roman custom of burning was adopted by many Romanized Britons, others still held to the ancient custom, as examinations of Roman cemeteries abundantly show. During the later part of the Pre-Roman period, these burials by inhumation, at all events in the North of England, appear frequently to have taken place without any barrow having been raised over the body; for certainly in most instances, where they have been discovered, there is no appearance of any mound having ever existed above the cist which contained the interred body. Ploughing may have obliterated all trace of a very small barrow, but we are inclined to think that in many cases the cist was sunk in the natural surface, and that no barrow was ever placed above it. It is not an unfrequent thing to find several cists of this kind placed near each other, too near to have had each its separate barrow, and yet covering too large a space to have had a mound over all small enough for every trace of it to have disappeared in course of cultivation, for we have seen such cists in old grass pastures where there is no sign of the plough ever having been used. These burials in cists, where there is no appearance of a barrow, are frequently found accompanied by urns of excellent shape and manufacture, and elaborately ornamented over their whole surface—many of them, of what has been called the "drinking-cup" type, and which were very probably placed there to receive food or drink for the use of the person whose body they accompany. Bronze daggers, of very skilful make, are also commonly found with males; whilst necklaces of jet, beautifully figured with rows of dots, forming various patterns, sometimes made by minute points of gold being inserted into the jet, more usually by punctured holes, are the frequent adjuncts of females.

* Iron was in common use in Britain when Cæsar landed, and it must have been therefore known for some considerable time before that date. We cannot, I think, place the introduction of iron later than two centuries before our era, if indeed it does not reach to an earlier period.

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The burial, which is the subject of this paper, was found December 14, 1863, on a farm occupied by Mr. Clark, at Ilderton, and to his care and intelligent interest we are indebted for the preservation of the skull, which would otherwise have perished, as has been the fate of nearly all those that have been hitherto discovered in Northumberland.* The cist, in which the body was found, was sunk below the natural surface of a round knoll, which rises several feet above the ordinary level of the adjoining ground. It is difficult to say whether any barrow ever covered it or not. Some years ago a large quantity of field stones was removed from the crown of the knoll, and from above the cist, but it is quite possible that these had been gathered off the land, and laid there, when the field was first brought into cultivation. The cist was formed of four slabs of sandstone set on edge, with a flooring of small flags, and one large stone, five feet six inches long by three feet broad, as a cover. The cist lay east and west, and was about three feet six inches long, by one foot ten inches wide, and eighteen inches deep. The body had been doubled up and laid upon its left side, with the head to the east, the hands had been folded upon the belly, the legs drawn up so as to bring the knees close to the chin, and the head and fore part of the body slightly inclined forward. The bones, when first discovered, were of a chalky whiteness, but soon changed to a red earthy colour, which they still retain. All the teeth were then present, but many have since been lost. No urn, implement or weapon was found in the cist.

The body was deposited in the manner usual in burials of this kind, being doubled up; it was laid upon the left side, a position which, though not universal, is by far the most common.

Taking into consideration the formation of the cist, the way in which the skeleton was found placed within it, and the very marked type of the skull, we have no doubt in attributing the

* We must acknowledge our great obligations to Mr. James Moffatt, of Lilburn Cottage, who, in the kindest way, gave us information of all the facts connected with the position of the body, and who, from his knowledge of the ancient remains in his neighbourhood, has otherwise been of the greatest service to us.

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burial to the later period of the time during which a bronze-using people occupied Britain before the Roman invasion, and who were, in the main, the inhabitants of our country at that time. It is perhaps in vain to assign any date, even an approximate one, for this interment, the only thing about it which can be laid down with confidence is, that it belongs to a time previous to that in which Rome began to influence the habits of the Northumberland tribes, for the facts connected with it all point to the British mode of burial in its integrity.

Our chief attention has been directed to the skull, which, together with the other bones, was in a very good state of preservation.

The skull is robust, well arched, and symmetrical, its superciliary arches are very prominent, and its external angular processes well developed. The forehead slightly recedes. The occipito-parietal region is large and rounded. The nose has been of moderate size, but the lower ends of the nasal bones are broken off. The mouth is rather large and well formed, the jaws strong, and contained a full set of sound teeth, a good deal worn, especially the large molars. The lower jaw has a strong, square and somewhat projecting chin, the angle is not far from being a right angle, and the distance across from angle to angle is considerable. The frontal sinuses appear to join together, and form a projection over the root of the nose. The temporal fossæ and spaces of origin for the temporal muscles are wide and large. The sutures, coronal, sagittal, and lambdoidal, are partially obliterated.

Taking this last character, with the number and state of the teeth, and the general condition of the skull, it may perhaps be inferred to have been that of a man about forty-five years old. Again, considering the strong muscular impressions on the long bones, and size and strength of the cranium, it may perhaps be correctly concluded to have belonged to a man of robust frame, and of good intelligence. His stature, as inferred from the length (19·1 inches) of the femur, must have been about five feet ten inches.

The following are the principal dimensions of the skull, taken

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according to the method adopted by Dr. Thurnam, in his interesting and valuable Essay "On the two principal forms of Ancient British and Gaulish Skulls."

Probable Age.	I. Cubic capacity.	II. Circumference.	III. Length.	IV. Breadth	V. Height.	VI. VII. FACE.		A Breadth Length, = 100.	B Height Length, = 100.
						Length.	Breadth		
Years.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.		
45	95	21	7	6 (t)	5·6	5	5	85·7	80

The capacity was taken with fine sand (ground flint) of sp. gr. 2·65.

In Dr. Thurnam's Table of twenty-five Brachycephalic British skulls, the average proportion of breadth to length is 81, that of height to length 76 to 100.

The Ilderton skull is therefore above the average of brachycephalism, as given in Dr. Thurnam's Table.

Other dimensions of the skull are as follows:—

	INCHES.
Fronto-occipital arch	14·7
Length of frontal	4·8
Ditto parietal	4·8
Ditto occipital	5·1
Intermastoid arch	15·0
Breadth of frontal	4·9
Ditto parietal	5·5
Ditto occipital	4·6
Height of frontal	5·7
Ditto parietal	5·6
Ditto occipital	4·3

The right femur measured 19·1 inches in length. The ends of this bone are rather larger in proportion to the shaft than is usual, and the shaft more arched.

The right humerus is 13·3 inches in length, and is well formed. In both bones the muscular impressions are well marked.

The above measurements have been carefully made, and accurate drawings on stone, from photographs of the skull, have been executed by the Messrs. Lambert, of Grey Street. The

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accompanying plates will convey an excellent idea of this fine skull.

Plate XIII is a profile view, half the size of the original, and has been minutely finished in all its details.

Plate XIV gives four different views of the skull, quarter size, and partially shaded.

XIV.—*On Human and other Remains found in a Cavern near the Ryhope Colliery.* By James W. Kirkby and George S. Brady.

At the last Field Meeting of the Club at Marsden (October, 1865), a discussion took place relative to the occurrence of osseous remains in a cave near the Ryhope Colliery; and a committee* was appointed to enquire into the facts of the discovery, and to watch the further progress of the excavations. After visiting the cavern several times and carefully examining the remains that have been preserved, we present the following short report—not so much on account of any great scientific value attached to the remains, as for the purpose of recording the nature of the discovery and the circumstances under which it took place.

The cave is situated on the north side of what was once a very picturesque glen, directly opposite to, and not fifty yards distant from, the Ryhope Pit. This portion of the valley is called Hollicarr Sides, though it virtually forms the eastern termination of a larger waterless valley named Tunstall Hope. Prior to the sinking of the pit the sides of the glen would be nearly fifty feet high; but that height has been greatly reduced by the deposition of ballast in the vicinity of the pit; and as the mouth of the cave is at present on a level with the surface of the ballast heap, its position originally must have been about half way up

* Dr. Embleton, the Rev. W. Greenwell, Messrs. E. C. Robson, G. S. Brady, and J. W. Kirkby.

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the side of the glen, which was once undoubtedly steep and precipitous, though the accumulation of debris at the base has subsequently transformed it into a bank of half crag, half bramble-covered slope, like those which so often characterize the minor vallies of limestone regions.

The rock in which the cave is excavated is described by Mr. Howse as the Middle Limestone of the Permian series of Durham; by Professor King it would be called the Pseudo-brecciated Limestone. It varies greatly in hardness and general structure, and thus offers a more than usually favourable material for the formation of caverns. There are indeed indications of several other caves of limestone in the immediate neigbourhood.

The cave appears to have run in from the old face of the rock as a narow passage, about two feet high and three wide, descending gently as it advanced: it then enlarges somewhat, both laterally and in height, though, so far as we have been able to examine it, it is never more than between three and four feet high. On the east it is connected by a small opening with another passage smaller than the first. As the whole of the debris had not been removed at our last visit we are not quite in a position to say that the end of the cave has been reached, though from appearances it is probable that such may be the case. The sides and top of the cave are somewhat irregular; but where the rock is hard it is worn smooth, or coated with calc-sinter. The cave earth is composed of soil mixed with marl from the sides. It does not seem to have been washed in; at least there is no trace of its deposition by water. The bones—those belonging to human subjects excepted—are scattered without any order through the cave earth. All of them contain more or less animal matter, the great majority having apparently lost very little of it. A few however have lost considerably more than the others; these may be older, or they may have been less favourably placed for preservation than the rest. None of them are in the least degree fossilized. With the bones occur numerous shells of *Helix nemoralis*, *Littorina littorea*, and *Patella vulgata*. Fragments of small branches of trees are also common; and in one instance we observed a few small pieces of charcoal.

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In the examination of the bones we have had the kind assistance of Dr. Embleton.

Immediately after the discovery of the remains, and before the interest which might attach to them was at all understood by the workmen on the spot, great numbers of the bones were carried away by the people of the neighbouring pit-village, and no doubt speedily found their way into the stores of itinerant rag-and-bone merchants. But when the possible importance of the relics was represented to the managers of the colliery, they at once gave orders that any future discoveries should be carefully preserved, and all bones which have since come to light have been handed over to the Sunderland Museum, where they are now deposited. The large quantity of bones abstracted in the first instance makes it impossible to state with certainty the total number of human skeletons, or to say whether the entire skeletons were actually there, and considering the fragmentary character of the remains now extant it seems useless to give a catalogue *in extenso*. We shall therefore content ourselves with a brief notice of them.

Of human bones there are in the Museum, at Sunderland, four skulls; two others being, we believe, temporarily in the possession of Mr. Greenwell, of Durham, but these last we have not seen. Of those at Sunderland three belong apparently to adult males, and one to a young female. Two of the male skulls, but *one* more especially, are very massive and strongly developed both as regards the facial and cranial portions. These have also apparently lost much more of their animal constituents than the younger skull. As to race there seems little or nothing in their characters to point to any considerable antiquity. Besides the skulls there have been preserved many other bones belonging doubtless to the same skeletons, and comprising detached vertebræ, scapulæ, pelvic bones, ribs, and bones of the upper and lower extremities. It should be noted also that we saw at Ryhope the lower jaw-bone of a child, which must have formed part of a seventh skeleton: this has unfortunately disappeared.

The bones of the lower animals comprise fragments of skulls of the dog, rabbit, goat, and sheep, many broken jaws of the pig, sheep, ox, and dog, as well as fragments from other parts of

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those animals. Part of the jaw and one of the cranial bones of a fish were also found. These may all be supposed to have been brought there by human agency, or to have inhabited the cavern at the same time as man. But there were likewise many bones of small wild birds as well as of barn-door fowls, some of them with feathers still attached, and all evidently of quite recent origin. For these the fox must doubtless be held responsible.

It will be seen that none of these remains necessarily indicate great antiquity. Even as belonging to the historical era they would scarcely appear to date many centuries back. Had the human bones and shells not been present, the rest of the remains could easily have been accounted for by our looking upon the cave as an old fox-hole. We conclude, however, that the cave must, at some time or other, have been used by man as a place of resort—as is indicated by the burnt wood and remains of edible shell-fish—and afterwards, either by intention or accident, as a place of burial. We have evidence of the presence of not less than seven human beings, five of whom seem to have been males, one a female, and one a child. Why so many of our fellow creatures should have left their remains there, at a period which cannot but have been comparatively recent, is difficult to understand; nor can we even venture to hazard a conjecture as regards this part of the subject.

XV.—*On the Opening and Examination of a Barrow of the British Period at Warkshaugh, North Tynedale.* By the Rev. Geo. Rome Hall. (Plate XV.)

Among the numerous vestiges of the pre-historic vale-dwellers of the North Tyne, yet remaining, are several *tumuli* or barrows. At High Shield Green a group of such burial mounds takes the form of an ancient cemetery. They are clustered around a great central cairn on a lofty eminence, not far from several ancient British camps. In the autumn of last year (1864), six or seven of these barrows were carefully examined, including

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"Dan's Cairn," but without any results worthy of remark.* An immense mound of earth, with deep surrounding fosse, stands at the junction of two ravines, under the great basaltic crags of Gunnarton. It resembles the so-called bell-shaped or conical barrow of the South of England, though from the conformation of double ramparts and ditches which pass from brink to brink of the adjoining ravines, the idea of its use as a work of defence and post of observation is suggested to an observer. The "Money-Hill," as it is popularly named, from the local tradition of concealed treasure, was lately excavated under the direction of the Rev. W. Greenwell, to whom I have been much indebted for information on disputed points in connection with the examination of the Warkshaugh barrow, and in preparing the present account of its opening and contents. In the case of the Gunnarton Money-Hill we came upon traces of a mediæval exploration, in the shape of the fragment of a drinking-vessel of that period. But the evidence of its sepulchral origin was at best negative, as no sufficient traces of inhumation were found to warrant any strong opinion—though such a result, after the lapse of so many ages from its first formation, cannot be considered unexpected. Nor is it conclusive proof against the possibility of an early interment, as many of the more ancient barrows, generally allowed to be such, have proved similarly unproductive. This very remarkable mound and its associated works (whether it was made for interment, for defence, or as a session mound for

* This barrow is about forty feet in diameter, and three feet high, after being used as a quarry for the formation of the neighbouring fence walls. The original interment had no doubt been reached, and every trace of associated relics destroyed. The name is probably a traditional reminiscence of the fearful ravages of the North-men, *Dan* being a familiar rendering of *Dane*, as "Dan's Linn," a precipitous escarpment of limestone with ancient ironstone workings beneath, occurs about two miles to the west of the cairn. (Compare the "Dane's Holes" and "Danes' Graves" of Durham and Yorkshire.) In one of the smaller barrows was found at the centre a circle of stones, set on edge, about three feet in diameter, within which only fragments of charcoal and chippings of freestone reddened by the action of fire were noticed. A similar circle was discovered by the Rev. W. Greenwell, in one of the *howes* which he opened in the North Riding of Yorkshire. It contained two urns with burnt bones, and a smaller urn inverted over the mouth of one of the larger urns. The stones composing the barrow were in both cases much burnt. (See *Archæological Journal*, Vol. XXII, Notices of the Examination of Ancient Grave Hills in the North Riding of Yorkshire, in the year 1864.)

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law gatherings and Druid ceremonies,) will well repay a visit, and it is in the neighbourhood of British forts on the Gunnar Crags and Pity-me Hill.*

It must be confessed, that in the matter of barrow-diggings, the ploughman in this district has been more favoured by fortune than the antiquary. Though several interesting tumuli have been accidentally discovered in this valley, even within the last few years, no careful examination of them seems to have been attempted, or, at least, no record of it remains. Solitary burials of the pre-historic or Romano-British period have been found in drainage at Carry House, on an escarpment near the Warksburn Bridge, where it falls into the North Tyne, and in a low-lying site by the river at Smalesmouth, near Falstone. In the first case an urn, having the ashes of cremation within it, was taken out of a cist or stone-lined grave, strangely enough, placed almost in the centre of a British fort. The urn is lost, having been at once broken to pieces by the finders when disappointed in their expectations of a concealed hoard. In the second instance an ornament of black bog oak, perforated with five holes, as if used in securing the proper adjustment of the lady's attire who was buried there, in primeval days, was found within the cist. And in the last example, the covering-slab of the cist attracted the attention of the road-makers, who were in want of material for breaking up, when the grave itself was uncovered. The urn, of the so-called "drinking-cup" type, was in excellent condition, from the dryness of the site by the way-side, and though it stood nearly twelve months in a neighbouring cottage, at Greystead, I found it in good preservation. It is now in Mr. Greenwell's

* The resemblance between the mysterious concentric circles incised on the rocks of Northumberland, and the configuration of these ancient earth-works, was pointed out by Mr. Greenwell, who has the honour to have first brought the subject of these most interesting rock-symbols before the public, in a paper read at the Newcastle meeting of the Archæological Institute, in 1852. The great central mound represents the hollowed cup of these symbolical figures, around which are similar concentric lines, in this case, the surrounding ditches and rampart. From the centre also a projection, as it were, of the diameter passes through and beyond the encircling lines. The hollow way of the Money-Hill fort runs for a distance of one hundred and twenty feet from the circular fosse, and answers to the duct or channel which leads out from the central cup of the rock inscriptions.

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collection, and is represented (plate XV, fig. 1) in the annexed sketches of British sepulchral remains of this locality.

One or two family-barrows of the same early period occur in the district. Near the Barrasford School-house, on a natural outburst of the basalt, which was ploughed around for several years in succession without suspicion of anything but a "quarry," three or four cists were at length disclosed by the till. In one cist was an urn, which was so little valued by its possessor, that it fell in pieces in an out-building through exposure to the weather. In a cultivated field on the Barrasford Green farm, a large barrow, formed of massive stones, was similarly uncovered a few years since by the plough. Five cists were contained in it with urns in each, of which only one, of the so-called "food-vessel" type, with very peculiar scorings, has been preserved, having been sent by Mr. Thompson, the farmer, to the Alnwick Castle Museum. This urn is also represented (fig. 2.)*

Such are the chief sepulchral remains of the early inhabitants of this district, which had come to my knowledge previous to the exploration of the Warkshaugh barrow. This interesting and important tumulus, which has been carefully and thoroughly explored and examined, I now proceed to describe.

In November last (1864) one of Mr. Snowball's farm-servants, in ploughing a field opposite to Wark Station, struck against an inverted urn in a spot within a hundred yards from the river-bank. The plough carried away the upper portion, as it stood on a level with the surface, so that the ploughman was able to put his hand through the aperture in search of the treasure, hidden therein, as he expected, in the "troublesome times." His hasty investigation, however, was so ill-rewarded by the handfuls of calcined bones which he brought to light, that he scattered them around him in disgust, and but a small portion have been recovered. When the farmer himself went to the site of the discovery, he at once sent for Mr. Henry McLauchlan, who was then at Wark engaged on his antiquarian survey and map of the county for the late Duke of Northumberland. After

* I am indebted for the sketch to E. Chapman, Esq., who kindly had it drawn of the original size.

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Mr. McLauchlan had taken the dimensions, the urn unexpectedly fell in pieces from the damp state of the surrounding soil after recent rains. Close to the urn on the east they noticed a freestone slab laid horizontally, and on further use of the pickaxe and spade a second, and then a third, forming a kind of flagged path about three yards in length. Here another slab, placed perpendicularly, was found to intervene between the end of the last, and a fourth slab, so massive in its proportions, that it was taken to be merely a "quarry" or outburst of the freestone rock. Happily, with the aid of crowbars, Mr. Snowball and his men removed it in fragments, and were rewarded for their perseverance by uncovering at length a well-formed cist or stone-lined grave, on the top of which this huge slab had been placed. It was at this stage of the excavations that I saw the barrow. From observation of the ground it seemed to have covered a large extent of surface, rising gently towards a centre on all sides, and might reasonably be supposed to contain more than one interment. I thought it desirable, therefore, to have the spot carefully examined, and having asked permission of the proprietor, J. H. L. Allgood, Esq., of Nunwick, he not only readily granted the request, but with great courtesy furnished the men to make the exploration, as far as was thought requisite.

It was not until several weeks after the discovery, in January of the present year (1865), that I had the opportunity to proceed further with the examination of the Warkshaugh barrow. Our first endeavour was to dig a trench seven yards long, and four and a half feet wide, nearly due north from the site of the inverted urn when first observed. The depth was from two and a half to three feet, being slightly beneath the undisturbed surface. In this direction, towards the western edge of the barrow, nothing of importance was noticed, except a pavement of waterworn stones, evidently put there by design, about a foot below the soil, and on a level with the urn. Some of these stones were reddened by the action of fire. Another trench was next dug at right angles to the former, bearing nearly due east, along what seemed to be the highest part of the gentle slope. This was made of considerable width—twelve feet, and about the same depth as

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the other. The workmen had proceeded (with Mr. Snowball's aid and direction during my absence for a few hours,) more than ten yards before they met with any different indications. On my return, towards night-fall, they had just struck upon a second cist with an urn contained in it, which had unfortunately been broken by the fall of a side slab ages before. Next morning this cist was carefully cleared out, and the fragments of the urn hardened by exposure to fire on the spot, so that now they have been put together by Mr. Greenwell so as to show the shape and ornamental scorings. Probably the first urn might have been saved by similar means. A small and rude flint knife was found among the sand which filled this as well as the other cists. Beyond the second cist, but closely adjoining it on the east, a trench was also excavated, where some immense water-worn stones and slabs were seen to protrude. It was cut from south to north, along what appears to have been the eastern face of the barrow for nineteen feet, by ten feet in breadth. As it was just possible that between the southern and eastern cists a third interment might have been placed, we next had a trench of rather less dimensions dug in that direction from the second line of excavation. Here we were not long in coming upon another cist with very massive covering, slab smaller, and more irregular in form than the other cists. There was nothing within but fine sand.

The barrow remained open in this condition until the beginning of May, and was seen by Mr. Greenwell and others. At this time Mr. Snowball, to whom I am under great obligations for his frequent assistance in our explorations, desired to fill in the site in order to proceed with the tillage of the land. In probing a few inches beyond the large northern trench he found, at almost the last moment, the central cist, which I had not thought to exist, from the result of our earlier excavation. This fourth cist, which in so large a barrow was not difficult to miss, had no covering slab. It had no doubt been displaced by the plough some time since, as it occupied a slightly higher relative position than the rest. This cist also contained no remains, though it was lined with a large and well-shaped slab at the

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bottom. The discovery of the central cist was very opportune, as it completed, in all probability, the sepulchral design of this ancient family-barrow, and proved it to be in all respects an excellent typical specimen of its class.

The following details, drawn from personal observation and measurement, may not be devoid of interest. I regret that the Tyneside Naturalists cannot verify the survey and the sketch now before them by an actual inspection for themselves. The inexorable march of the seasons and the requirements of modern husbandry, as unchangeable when archæology only is concerned as the laws of the Medes and Persians, demanded that our labours and their recompense should be once more buried from the light of day. It may be that when Lord Macaulay's New Zealander ponders over

"The long results of Time,"

on London Bridge, some local antiquary will resuscitate these twice-sepulchred relics of the past, and re-describe them in their less perfect state to such of our successors as feel, with Terence, a human interest in all that affects our race,* or throws a ray of light on its earliest phases and conditions of existence.

To begin with the characteristics of the Warkshaugh barrow itself—its *position* and *internal arrangements*.† The situation is very unusual, low-lying by the brink of a turbulent river, which in flood might be thought to have washed over its site a thousand times since it was originally placed there. Before the river embankment was made the overflow must have approached very near to the western face of the tumulus; though we can scarcely suppose that the builders of it, in times when the rain-fall would be much larger than it is now through the great extent of primæval forests on the flanks of the Cheviot range, would endanger the perpetuity of their monument of tribal or family affection by placing it within reach of even the highest flood. All the "*carneddau*" or tumuli of the district, which I have before noticed,

* "Homo sum; humani nihil a me alienum puto."

† A rough plan of its situation on the Warkshaugh farm is appended, together with a more exact ground-plan of the barrow, wherein the relative position of the cists, flagged-way, and cinerary urn, is defined.

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stand on sites considerably elevated. Some occupy positions, as Dan's Cairn, which overlook the whole upper reach of the North Tyne, and could be seen from the Scottish hills, in accordance with the usual desire of a Pagan chief to have his name and fame held in remembrance after his death. Of these the words of the bard are descriptive, when he says of his buried forefathers,

——————— "Yn garnedd
Mewn gwerni mae 'n gorwedd:"
"They are lying in the barrow on the *moor*."

But respecting this tumulus, the site of which within memory almost has been overgrown, like the rest of the valley-slope from the river to the Watling Street, with underwood and natural oak, the answering description would be couched in another line—

"Eu beddau a'u cudd gwyddwal:"
"Their graves are hidden by the thicket."

The outline of the barrow has long been rendered indistinct by yearly tillage; but it can be remembered since it stood at least two feet higher than it does now. The ring of larger stones which usually encircles the base of such tumuli could be easily seen at the east and north, within which the level surface appears to have had a rough kind of pavement. Here, where many of the stones were reddened throughout by fire, the funeral feast may possibly have been held, as a kind of sacrifice to the manes of the departed, according to the prevailing custom of ancient mourners, civilised or barbarian—one, too, which has lingered in this valley through both Pagan and Christian times to this day.* The funeral pyre was also probably erected in this open space for the burning of the body, whose calcined bones were enclosed in the urn which was first discovered. The whole barrow must

* In Brand's "Popular Antiquities," Vol. II, p. 237, (Bohn's Edition,) there is a full description of these "Funeral Entertainments," which are traced down from very early times. Hutchinson, in his "History of Northumberland," Vol. II, ad. fin., p. 20, assigns the origin of the *Arvel*-dinner to the British period; the word, still not uncommon in the North of England, namely, Arthel or Arvel, being "frequently more correctly written *arddelw*." The similar funereal banquet among the Greeks and Romans is well known. See, especially, Juvenal, Satire V, l. 85. An allusion to the same custom occurs in Hamlet, Act I, sc. 2, who, speaking of his mother's marriage, says—

"*The funeral bak'd meats*
Did coldly furnish forth the marriage-tables."

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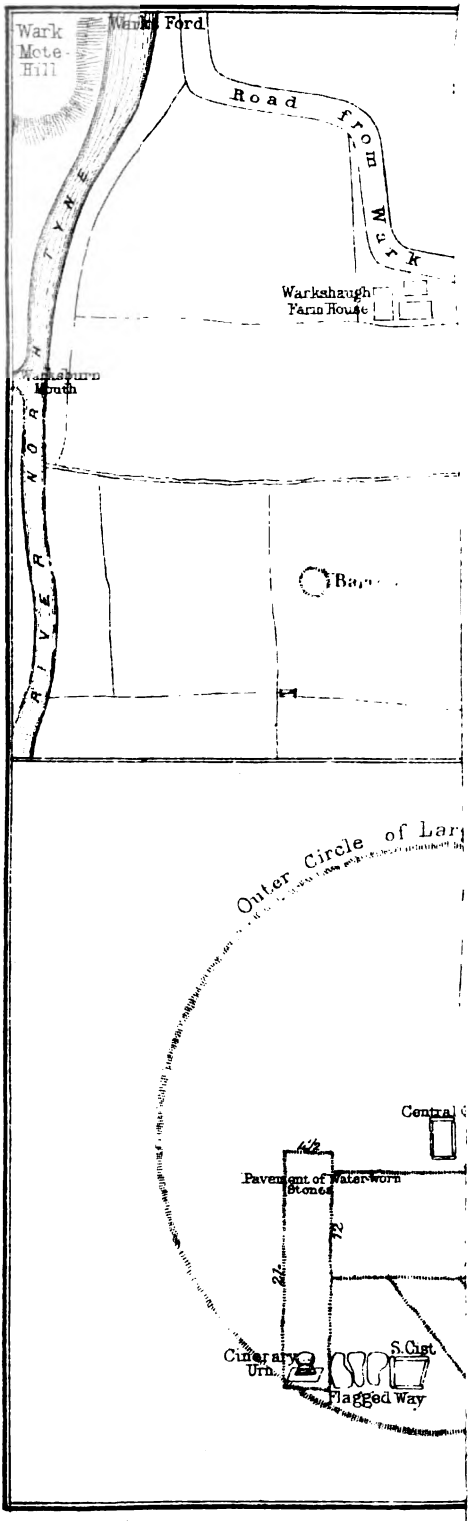

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have been not less than sixty feet in diameter. Its internal arrangements are of peculiar interest. The southern cist, as we have seen, was connected with the largest urn by a rude kind of flagged path—the use of which it is difficult to conceive. A closer bond of relationship or regard no doubt underlies the cause of its construction. Perhaps husband and wife were thus united even in their last home—perhaps father and son, falling in battle together, in contesting the ford of the Tyne below or above the adjoining "Mote Hill" of Wark,* like Saul and Jonathan on Mount Gilboa, "in death were not divided;" and the survivors perchance deemed that their spirits might in this way hold more intimate communion with each other. But the precise cause of this peculiar connection between cist and urn is confessedly among "the secrets of the grave." The arrangement of the cists is precisely what past experience would suggest, namely, a central, and, probably, in order, earliest interment, then a second on the east towards the sun-rise, and a third and fourth following the apparent course of the sun in the heavens, towards the south-east and due south. This arrangement can hardly be dissociated from the known solar-worship of the ancient Britons, and indeed of every early race of mankind without a revealed religion, which is also exemplified in the circular form of hut-circle and fort alike, having their entrances chiefly on the east. Another reason for the absence of the cists on the north and west is, probably, the natural desire common to all men that their mortal remains should lie not in the shade but in the glad sunshine in which they had loved to bask in their life-time. Our

* It is remarkable, that a narrow tract of land on the Birtley margin of the North Tyne, opposite to the Mote Hill, has from time immemorial formed part of the parish of Wark. This long tract of rich alluvial soil constitutes the Warkshaugh farm on which the barrow is situated. The name proves, that as far back as the Saxon period, it was attached to the village of Wark, the ancient capital of the royal franchise of Tynedale, although wholly separated from it by a wide, and often impassable river. The fact of the Mote Hill (an elevated platform of natural rock, perhaps, as tradition asserts, improved by artificial means,) having always commanded the excellent ford beneath, one of the best on the North Tyne, may be held to countenance the suggestion of my friend, the Rev. H. Taylor, of Wark Rectory, that in the British period the tribe holding this excellent vantage-ground would be able to extend their boundaries beyond the river, where no similar place of defence exists in the flat haugh before mentioned. Undoubtedly it would be the scene of many fierce encounters between the hostile septs of aborigines who inhabited the opposite banks of the river.

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dalesfolk are so wedded to this sentiment of their most ancient ancestors at the present hour, that it is often difficult to persuade them, even in a crowded churchyard like that of Birtley, where primitive usages are still in full force, to consent to their relations being interred on the north or shaded side, whose surface is therefore but seldom disturbed until it becomes a necessity from want of space elsewhere. The same reason which has caused the Druidical circles of the Anglo-Scottish Borders to abound only in the West, in Westmoreland and Cumberland, may have some connection with the avoidance of the western part of the barrow for purposes of interment. *Annwn*, the west, was the *Sheol* or *Hades* of the ancient Britons, the land of the dead, and therefore regarded with especial reverence.* And this may also have something to do with the choice of its peculiar site as lying in the western-most portion, probably, of the tribal territory of that sept (of the Celtae) who inhabited the eastern bank of the river and built this sepulchral monument.

With respect to the different "*cistveini*," or stone-lined graves, and their dimensions, I shall take their natural order, as they may have been originally arranged, and not that of their discovery. The *central cist* was as follows, within the enclosing slabs—the sides three feet four inches, and three feet two inches, the upper end-slab one foot nine inches, and that at the bottom one foot six inches. The flagstone underneath, at the depth of one foot six inches, seemed almost to be squared by a modern mason, so clearly defined was its form, three feet two inches long by two feet one inch broad, and four inches in thickness. This large freestone slab was reddened by fire on the upper surface, and the cist itself was near to the spot where most of the burnt stones were found. The stone-chippings found in it when the sand was removed were also reddened, almost allowing the conjecture that the body had been burnt within the cist. A good deal of black earthy matter, of an unctuous nature, (no doubt, the remains of the decayed body which had been placed here *unburnt*, and of the fragments of the funeral feast, perhaps,

* Davies' "Celtic Researches," p. 175.

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mingled with many small pieces of charcoal,) was found however near the top or head, in this as well as in each of the other cists, and effectually disproved such a theory. The *eastern cist* was peculiar in containing an urn, though not with burnt bones in it, or the ashes of cremation. It measured two feet five inches in breadth, and the two side slabs were three feet five inches, and three feet three inches long. A massive slab, four feet in length, by two feet nine inches broad in the widest part, and seven inches thick, covered it, and a second covering slab, two feet six inches long by fourteen inches wide, was laid over it at the head or north end. When first opened a bottom slab appeared at about nine inches deep, which proved to have been originally placed at the west side, and had afterwards fallen inwards, crushing the urn, and forming the apparent bottom lining. Several large water-worn stones were set round the covering slab, and their weight had caused the fall of the other on that side. Here we were able to inspect a section of the sand which filled each of the cists. It appeared to have been brought from the margin-beds of the river, and not to have percolated, as we might suppose, in the slow lapse of centuries with the rains or floods descending through the super-incumbent mass of loose materials of which the barrow was composed. Only a few years since the base of the cairn remained, and so numerous were the stones found on the spot whenever it was ploughed that the farm labourers declared that "they grew." The section consisted first of a four-inch layer of fine sand on which to place the body, then a mixture of soil beneath, two and a half or three feet deep, of darker colour than the rest, and, lastly, the alluvial drift in its natural undisturbed condition. This cist was formed more carefully than the others, of good freestone slabs, as if to do honour to the person whose relics it held in safe keeping. The *south-eastern cist*, on the other hand, was the most rudely formed of all. The huge covering slab, three feet eight inches long, by two feet six inches wide, and nearly a foot in thickness, seems to have pressed the lining slabs beneath into their irregular shape, and made it appear smaller than it would originally be. It was, indeed, the least in size, averaging two feet four inches

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long, by one foot three inches wide. The *southern cist* had one of its side-slabs rather shorter than the other—three feet five inches, and two feet nine inches respectively, the end slabs being one foot eleven inches, and two feet one inch in length, so that the average width of the cist was two feet. Here, as in that at the centre, was a bottom slab at about two feet six inches below the cover, which gave hopes that some portion of the inhumed skeleton might have been recovered. Very small fragments of bone, not sufficient to show anything definite, mingled with the dark unctuous matter as in the other cases, and with tiny pieces of charcoal, alone remained. As none of the cists could be perfectly water-proof, though plainly constructed with great care, it is only left us to infer that the carbonic acid, held in solution by the water gradually percolating through the layers of stones and sand had been enabled, in the long period which must have elapsed since their original formation, to dissipate even the osseous substances of the human frame, and bear away almost every vestige of the interred body into the sub-soil beneath. The sources whence the massive slabs forming the various cists had come, were clearly the adjoining pools in the North Tyne. Mr. Hutchinson, indeed, of Warkshaugh, holds to the opinion that the great covering slab of the south cist could be taken only from the Park House quarry. At all events, these huge unhewn blocks (chiefly of freestone, except in the case of two slabs in the central, and one in the southern cist, which were of a crumbling bastard whinstone,) must have cost the ancient barrow-builders a vast expenditure of time and labour, with their primitive mechanical appliances, before they could be placed *in situ*. In the south cist, it should be added, protecting slabs were even placed edgewise like a roof over the cover. The relative level of the cists, measuring from the top of the perpendicular slabs to the surface of the soil, was as follows—central, nine inches; eastern, three feet seven inches; south-eastern, one foot six inches; and the southern, three feet three inches: the average depths of the cists themselves being about two feet.

The *urns and flints* found in or upon the barrow, and thus assisting, above everything else, to determine the age and race

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to which we may attribute it, remain to be briefly noticed. I was told by the labourers that, in my absence, they had found several urns, large and small, in prosecuting the digging of the later trenches. Fragments of these supposed urns were produced, which certainly bore a close resemblance to unscored pottery; but on nearer inspection they proved to be portions of the crumbling whin already mentioned, and they contained numerous small fossils. Two characteristic urns, however, were discovered. That which was not in any cist had been placed on a flat stone in a line with the paved way, and was protected from injury by four small surrounding slabs, being probably covered originally with another slab since displaced. A fragment, showing the peculiar scoring, is figured (fig. 3). This cinerary urn was seventeen inches in diameter and thirteen inches high, of a somewhat flattened form, with a rounded or slightly convex bottom, (the result, perhaps, of external pressure in a damp soil,) which the plough pierced in its inverted position. It seemed as if it had been made on the spot for its special purpose, and never used in a domestic capacity, as it could not stand alone if this was the original shape. After the calcined bones had been placed within it the rim had apparently been cemented to the bottom slab with damp clay to preserve them more securely. In the midst of the zigzag lines of scoring around the upper part of the urn, for like cinerary urns generally it was plain beneath, and embedded, indeed, in various parts of the pottery of both urns, but especially distinct in this larger one, were numerous bright specks of a golden colour, no doubt particles of mica mingled with the natural clay. The portions of the second urn found in the eastern cist were so far recovered that an entire side was obtained, from which the annexed sketch has been made (fig. 4). It is of a more graceful shape, of the so-called "food-vessel" type, and much smaller, having dotted scorings, made with a triangularly pointed instrument, ornamenting it from top to bottom. The dimensions are—six inches high, seven and a half inches the top diameter, and three and a half inches at the bottom. Unscored patches occurred at intervals of two or three inches around the urn, below the overhanging rim, from which little ears had

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projected, as we may suppose, for the purpose of suspending the vessel in the wattled house-circle of the departed British chief. In it also was a dark incrustation which might possibly be the prepared corn or food provided by filial or friendly piety for the sustenance of his enfranchised spirit in his journey to Annwn, the land of shades. This cist, besides pointed chippings of stone which a few years ago might have ranked as a rude kind of weapon, held towards the head a small *flint knife*, one and five-eighths of an inch long, by one inch wide in the widest part. I took it at first for an arrow-head, but there was no sufficient equipoise in its construction to carry it in a straight direction from the bow, being in this respect very different from the accurately formed arrow-heads in Mr. Greenwell's collection. The marks of human art and work are plain on one side in bringing it by a series of blows to a sharp edge. On the top of the barrow, close to the central cist, was also found another implement of chert, or limestone-flint—probably the so-called "thumb-flint" of Celtic antiquaries. The latter is a little peculiar in being not only chipped along one rounded side, but apparently ground by friction to a smooth surface around the other, instead of being struck off at one blow. The sharply defined end for use has been thus formed, and no doubt served the self-same purpose which such rude instruments subserve at this day among the Esquimaux—that is, to sharpen and smooth pointed implements of bone for dress, for fishing, or the chase, or even for their primitive weaving. Various chippings and fragments of flint and chert were also found on or near the barrow, cast there, perhaps, as part of the funeral rites; some of a yellowish colour, but mostly of the dark natural hue of the pure nodule with its encrustation of chalk. Mr. George Tate, of Alnwick, informs me, that the only part of Northumberland where flint occurs is in this valley; and that he found specimens of true flint in Lewis Burn, and a small boulder in the Whickhope Burn. He thinks that the primitive vale-dwellers obtained their supply from deposits *in situ* in the valley itself, and not far distant from the spots where they are found. A great number of flint chippings were certainly discovered in an ancient British camp at Pasture House,

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immediately above the village of Wark, in reducing the ground to tillage; and some, if not the largest portion of these, may have been brought down Wark's Burn, nearly opposite to whose junction with the North Tyne the Warkshaugh barrow was placed. But one of the small flint implements found in the eastern cist has plainly come from the pure chalk formation—and the nearest point where such nodules are to be obtained is the Yorkshire coast, near Whitby, whither they have been rolled by currents from the coast farther south. Such flints must therefore have been brought from a considerable distance. It is remarkable, that the field on which the tumulus was raised (especially around its immediate site), is well known for the number of flint chippings that are continually brought to the surface by the plough. Mr. Snowball tells me that his workpeople are accustomed to look there for a piece of flint on which to strike a match, whenever they rest from their labours, whether men or women, in order to solace themselves "with a pipe;" and an ancient dame always declared she could find flint readier to hand than the less effective sandstone.

From data already given, it will be seen that this barrow had for its builders some of the earliest, if not the aboriginal inhabitants of Britain. The pottery of the urns, and their scorings, differ considerably from those characteristic of urns of the later British or early Romano-British age, such as that found at Smalesmouth.* It is similar to a fragment now in the Alnwick Castle

* The larger urn was of the usual cinerary type, ornamented with a zigzag design around the upper part of the herring-bone pattern. It appears that at the period when this barrow was formed two modes of interment were in use—cremation, or burning the body on the funeral pyre, and deposition in a cist with or without an urn placed amidst fine sand. As the barrow was evidently round we can assign with safety the occupants to the brachycephalic race who succeeded, and, as a bronze-armed people, probably supplanted the dolichocephalic race, whose burial places are the "long barrows." The shape of the tumuli of the two races seems to have borne intentionally a close resemblance to the conformation of their respective *crania*. It is supposed that the latter race may have introduced both cremation and the use of metals. In the Warkshaugh barrow we find an interesting example of the two stages of inhumation: the first, when the relics of the burnt body were enclosed in a large, partially ornamented urn of coarse pottery; and the second, when an urn of a different type, scored throughout, and of finer make, was deposited by the side of the departed chief, who was laid in the stone-lined grave doubled up with the knees to the chin, and reclining usually on the left side facing the sun in its daily course in the sky. The peculiar flagged way from the cinerary urn to the southern cist proves almost beyond question that the two modes of interment were in this case contemporaneous.

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Museum, which came from a remarkable barrow near the Barrasford Station, where a second interment of an Anglo-Saxon warrior with his shield and sword—the former, to judge from the silver riveting disks, being of rich workmanship—had taken place centuries after that of his British predecessor. We cannot always determine the age of such sepulchral monuments merely by their contained relics, as the different periods of the stone, the bronze, and the iron age, of pre-historic archeology may well be conceived to have overlapped, so to speak, or "dovetailed" into each other. We might be inclined to attribute the Warkshaugh barrow to the earliest stone age, according to the usual classification, and carry the date of its construction as far back (for the rudeness of the flint weapons or implements will permit it) to the very remote period which saw the inhabitation of the bone caves, and the formation of the Kjökken-möddings of Denmark, and the lake habitations of Switzerland, and other countries. Sir John Lubbock has shown, however, in his "Pre-historic Times," that "the arrow was employed after the first cannon had been used in battle;" and that "it is evident, also, some nations, such as the Fuegians, Andamaners, and others, are even now only in an age of stone."* So that on the whole we may safely conclude that the formers of these cists, and those who used the rude implements which accompanied them to their last earthly resting place, were of that Celtic race who probably inhabited the numerous "camps" and hut-circles, and left their names engraved, as it were, in the most unchangeable forms of nature—in the rivers, and hills, and many local names of Western Northumberland.

The beginning, therefore, of the age of bronze—the close of that of stone—the Neo-lithic period of later ethnologists—centuries, probably, before the Roman legions, under Agricola, first traversed the eastern slope of this valley—undoubtedly saw the pious hands of a kindred tribe erecting this family sepulchre. Here, with solemn traditional rites, they laid their loved ones to rest with the same sun shining over them, the same river running

* Chap. I, p. 3.

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by, which we ourselves behold. And though we with the Christianised Cymro can no longer conceive such a burial honourable, whose proverb it became to wish in anger one against another,

"Ah! carn, ar dy wyneb,"
"Ah! a barrow on thy face,"

or, "May'st thou lack Christian burial;"—though the barrow has long been assigned only to the mortal remains of the criminal, the suicide, and the heathen, as Shakespeare most fitly represents the priest in "Hamlet" saying of the lost Ophelia,

"For charitable prayers,
Shards, flints, and pebbles, should be thrown on her,"

yet we must not forget that such poor memorials of affection were most suggestive to the human hearts that mourned around this their lasting monument, it may be, five and twenty centuries ago, and who saw in such observances—in the flaming pyre, the spark-emitting flint, the setting and rising sun,"* even in the "shards, flints, and pebbles" cast upon the funeral barrow, a faint but welcome recognition of man's renewal and revival to another, and, perhaps, higher life, when his pilgrimage on earth was done.

EXPLANATION OF PLATE XV.

Fig. 1. Smalesmouth urn. Height of original 7 inches; width at mouth 5¼ inches; width at bottom 2⅞ inches.

Fig. 2. Barrasford-Green urn. Height 3⅛ inches; width at top 5 inches; width at bottom 2⅜ inches.

Fig. 3. Fragment of large urn (half the true size) from Warkshaugh barrow. Height of urn 13 inches; width below rim 17 inches.

Fig. 4. Urn from Warkshaugh barrow, eastern cist. Height 6 inches; width at top 7½ inches; width at bottom 3½ inches.

* Professor Max Müller, in his interesting Essay on "Comparative Mythology," which he, more than any other, has aided to raise to the dignity of a science, thinks (*Oxford Essays*, 1856, p. 87,) that the elementary character of the pagan gods in its original conception by each branch of the great Aryan or Indo-Germanic race was almost always solar. He differs from Lauer and Kühn, who seem to connect that conception too exclusively with the fleeting phenomena of clouds, and storms, and thunder. Compare for the prevalence of the same heliacal worship among the early Semetic races, the words of the patriarch of Uz: *Job* xxxii. 26—28.

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XVI.—*The Sessions of the Liberty of Tynedale, held at Wark, in the Thirteenth Century.* By Edward Charlton, M.D.

The little village of Wark was once the capital of the Franchise or Liberty of Tynedale. It was a royal manor, and for a considerable time it was, with the rest of Northumberland and Cumberland, held by the Scottish kings, having being originally granted to them by King Stephen, to purchase their neutrality. Henry II of England, however, resumed the royal demesnes alienated by his predecessor; but in 1159 the Liberty of Tynedale was re-granted to Scotland, being given to William, son of Earl Henry, and father of Alexander II. Tynedale was a manor held by the Scottish crown of the kings of England by homage only, and the Scottish monarchs enjoyed their *jura regalia* here as much as in their own proper domains. Here, at Wark, and on the very spot where we now stand, they held their judicial courts, on the ancient Mote Hill or Hill of Assembly, which had no doubt been used for that purpose in Saxon, and perhaps even in British, times. There is no record of a castle or stronghold having existed here; but there was, no doubt, a building for the purposes of the Court. And in the fifteenth year of Edward I there was at Wark a capital messuage, with a garden and a park of ninety-six acres, containing various sorts of game, and also eight acres of meadow land attached to the house. The mill of Wark, of which no vestige now remains, was also the property of the Crown, and produced the enormous rent of seventeen pounds a year, while the herbage of the whole park only brought in two pounds annually. At that time William Conne was the keeper of the park, at a salary of three-half-pence per day. There was of course a prison here, and the repairs of the prison door in the year above specified cost tenpence. It is said to have stood nearly in the centre of the square of the present village. It does not seem to have been a very safe place of custody, for numerous entries in the documents we shall generally allude to are to the effect, that the prisoner was lodged there "et postea evasit." Robert de Insula or De Lisle, the then proprietor of Chipchase, was probably the lessee of the mill at Wark, as he

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paid sixpence annually for a dam across the water there. After the forfeiture of Tindale by John Baliol the manor was, in 1297, bestowed by Edward I on the Bishop of Durham. Within the last few years, two most important documents have been discovered in the Record Office, relating to the proceedings of the judges at the Royal Courts of the Franchise of Tindale held at Wark in the thirteenth century. One of these is of the date of 1279, under the rule of Alexander III, of Scotland, and the other in 1282–3, when the Liberty of Tindale had returned under the English Crown. In the first Court, 1279, there presided Thomas Randolph, Symon Fraser, Hugo de Peresby, and David of Torthorald, all justices itinerant of Alexander III, King of Scotland. In the Court held at Easter, 1293, we find English judges sitting, all well-known names in Northumberland—Walter de Cambo, Guiscard de Charron, and Hugo Galun. The record of the sitting of this Court was called the Iter or Journey, as the judges were termed the Justices Itinerant. The first Iter of Wark has already been printed in the Newcastle volume of the Transactions of the Archæological Institute; but besides being in Latin, the work is one accessible to few but members of that society. The second or English Iter of 1293 has only recently been found, and the only copy of it exists in MSS. in our hands, and will shortly be published in the Newcastle Antiquarian Society's Transactions. These records, as has been well observed by the late Rev. C. Hartshorne, "represent the condition of the inhabitants of Tindale at the period with vivid colouring, and are most valuable histories of the district, since they exhibit the tenures of land which were then common, the names of proprietors and tenants, names, in numerous instances, still prevalent—the terms of their occupancy, the nature of vassalage, the rights of the Crown, and its powers of fine and amercement, its prerogative of mercy, the well-regulated mode of trial by an assize, and the establishment of a jury." The great family of the Swinburne's held in the thirteenth century the lands of Chollerton, which they now possess, as well as those of Haughton and Humshaugh. William de Swynborne was treasurer to Margaret, Queen of Scotland, and in high favour with that Queen. Another powerful family

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held much of the land higher up the Tyne, in and around the town of Bellingham. There were the de Bellinghams, Foresters to the Kings of Scotland, by which title they claimed the manor of Bellingham. Much of the time of the justices itinerant seems to have been taken up at Wark in adjusting the claims of these two potentates, and deciding on the complaints made against them by their inferiors, of illegal seizures of land and goods from their poorer neighbours. The de Bellinghams are now represented by Sir Alan Bellingham, of Castle Bellingham, in Ireland; the Swinburne's still retain their position in Northumberland; while among their opponents not a few are to be found whose descendants are still landed proprietors here. It is singular, that in the only Scottish Iter of Wark that has come down to us, the title to the lands of Hesleyside, still possessed by the Charlton family, is proved against William de Bellingham, by Adam de Charlton; while the second or English Iter of 1293, shows us that the grandfather of Adam de Charlton was William, who held the same lands as his grandson and successor, and whose tenure is consequently to be dated from the commencement of the thirteenth century. How long the Abbots of Jedburgh held lands in North Tyne we know not, but in 1279 the said Abbots held the farm of Ealingham, and the boundaries between that and Hesleyside are the same, or nearly so, as at the present day. Some of the tenures of pasturage are very curious. Thus in the plea between Bartholomew Pratt and Robert de Insula, the latter pleads that his flocks and herds had the right to pasture as far as Tymberschawe Burn, and as far beyond it as they could, if they returned over Timberschawe Burn the same day. We have fines, too, inflicted for selling wine without a license, and in 1293 there is a complaint, made against certain parties, of their having broken open the dwelling house at Sewingshield, on the Northumbrian lakes, of their having torn away the iron fastenings of the door, and having helped themselves to half a dolium of wine, which William de Halton had for his own use. They departed, carrying with them a cowskin of the value of sixpence, and the "ferrum de porta sua tam in Hamis et Haspis et ligulis." John of Roston, brother of the Vicar of Haltwhistle,

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is convicted of selling a dolium of wine contrary to the assize. Twelve jurors present that a certain unknown thief stole four geese from the village of Newbrough, and being taken, by the order of Hugo de Farwithscheles they forthwith cut off his ear. John de Halton, however, does not seem to be always the aggrieved in the Court. Thus on the complaint of Thomas Fairman, it is stated in 1297 that he, with Thomas de Thirlewall, and others, came to Wark with force and arms, on the Saturday before the feast of St. James, in the eighteenth year of Alexander the King, and that he then seized thirty oxen, worth ten shillings each, eighteen cows, each worth half a mark, one bull of the same value, and two hundred sheep, both wether and ewes, each of twelve pence value; and then unjustly, and against the peace of our Lord the King, he drove the said flocks and herds to his dwelling at Sewingshields, where he shut them in his park, and doth still retain them. These were wealthy reivers, however, and a good money payment soon made all straight. John Adamson, of Wark, is summoned for frequenting the society of poachers, and for breaking the park of the King at Wark. He is found guilty, and fined twenty shillings—no small fine in those days. The canny Scots, even in those days, occasionally made a raid into Tynedale. Alexander of Lothian, Arthur of Galway, David of Clydesdale, and Hugh the Carpenter, broke into the house of William de Fenwicke, at Simonburn, and tying fast the said William, drove away the cattle. Gofton, near to Wark, seems to have been an unlucky locality. Matilda, wife of Elyas de Huntlaw, was drowned in crossing Gofton Burn, and Huctred Wethird, of the same place, had his house broken open, and his cattle carried off by thieves. John Davison killed John Wrenne in the town of Wark itself; and Norman Batey slew Adam Gálfridson in the mill at Wark. The record then gives evidence of numerous homicides. It is plain, too, that coals were worked in Tynedale in those early times. Robert, son of Adam, of Whitfield, was suffocated under ground while digging coals, "fodendo carbones oppressus fuit." Juliana le Kenbertre was found dead of cold under the park wall at Walwick; and John, the parker, dies by the bite of a dog, probably

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from hydrophobia. Wife beating is not, it seems, a modern accomplishment; for Thomas Scot, of Simonburn, wounded his wife Emma so severely with an axe, that she died four days after. A little further up the Tyne, Lynch law appears to be occasionally resorted to. Thomas de Caphopper was taken for a burglary, and there and then decapitated without authority, even of the Coroner, by the people of Donkleywood, Thorneyburn, and Tarset. The Coroner seems to have possessed greater powers in those days than at present. Adam Stokoe and Maurice Scot are summoned for the murder of Adam Thompson. Adam Stokoe denies the homicide, and escapes; but Maurice Scot acknowledges having taken Thompson's life, but avers that he did it against his will, being forced thereunto by the Coroner, William de Bellingham, with many stripes and injurious words, and by threats of instant death, unless he decapitated the said Adam Thompson. Treasure trove was strictly claimed by the King, and the results of this law were probably as disastrous then as they are at the present day. Some of the clergy did a little house-breaking at times on their own account. Symon, the clerk, and Richard Alpendache, clerk, forcibly entered the dwelling-place of John the Fuller, and carried away his goods and cattle. The parson of Whitfield fled his parish after stealing a cow from one of his neighbours; and the parson of Corbridge was taken for the same crime, "et pro pluribus latro-ciniis," but was claimed by the Bishop of Durham, and died in the episcopal prison. Adam, the servant of Brother Take, was hanged at Wark for breaking into the house of Ralph, of Caldecoates. Agnes, the wife of John Cuper, of Wark, was killed at the mill, at Wark, by the breaking of the millstone, while she stood by overlooking the grinding of her corn; but as the mill belonged to the King, there was no deodand with the verdict of accidental death. Huctred, of Linacres, was fined half a marc for refusing to feed the King's dogs; and Richard Humble, Gilbert, the miller of Ealingham, and Alexander, the miller of Wark, were each fined forty pence for killing salmon out of season. This, we believe, is one of the earliest instances of laws being put in force for the protection of the noble fish. The

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Humbles, of Bellingham, were noted salmon leisterers in our own days. Eleven years before this time, viz., in 1268, it was presented that a great destruction took place, in the waters of the country, of the salmon as they ascended the rivers to spawn. It was therefore provided that, from the feast of St. Michael (29th September), to that of St. Andrew (30th November), no net be drawn or put into the weirs or pools, and that no one fish in the Tyne, Wansbeck, or Coquet, or other waters, with nets, "stirkeldis," or any other engines during that time. And that, from the 1st of May, to the 24th of June, no net is to be used, unless its meshes are large enough for the smelts (salmunculi) to get through. And lastly, in 1293, persons were presented for having weirs too high for salmon to pass over. Of remarkable names we have culled a few out of both Iters, viz., Emma Wytherape, Gunnoca of the Mill, Grota, Aycusa de Goffeden, Idonea (wife of Adam Swynburne), Elyas Blessedblod, Thomas Smalfick, John Dulpinthedrit, Symon Wildegos, Adam Schakeharpe, Michael Lyteskyte, of Bellingham; and lastly, Adam Aydrunken, who handled his boat so clumsily, on the waters of the Tyne, that he upset it, and thereby drowned Beatrix, his wife. If his habits corresponded to his name, the good woman should have known better than to trust herself in the same boat with him.

XVII.—*Meteorological Report for* 1865. Edited by GEO. CLAYTON ATKINSON, Esq.

WYLAM.

January.—A fine month, with a general fall of the barometer, from 29·828 at the beginning, till the 14th; when, at eight A.M., it indicated 28·123 at Wylam, which is ninety-six feet above the sea. The barometer at the Literary and Philosophical Society at Newcastle stood, at nine A.M., at 28·236; and Mr. G. Wailes', at Burghfield House, Gateshead, at 28·342. I have never seen the barometer so low.

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This remarkable depression, was succeeded by a gradual rise until the 22nd, when it again fell till the end of the month.

No remarkable weather accompanied this unusual decrease of density in the atmosphere, in this neighbourhood. The 12th I find noted, "cloudy, windy, fine day; wind SSW.:" the 13th, "fine day, gentle SW. wind:" the 14th, "clear, calm, fine at eight A.M.; very fine day afterwards, sunny and calm:" the 15th, "clear, fine, gentle breeze. Wind W."

The mean temperature of the month was 35·35, being very nearly that of the average of the preceding nine years at Wylam; the lowest point in the shade was 12°, during night of 25th; and the highest 53°, on the 9th and 11th.

At Seaham Harbour.—The month was fine and frosty; stormy at the end.

February.—Not bad weather, in spite of great fluctuations in the barometer: no violent wind nor storms, as might have been expected from the disturbance of the atmosphere. Beginning at 28·618 on the 1st, the barometer rose steadily till the 10th, when it reached 30·475, and then fell as steadily till the 19th, when it stood at 28·755. On that day, although marked at Wylam, only "a wild, snowy, windy day," there was a gale from NE. on the coast, and a small vessel was wrecked at Hartlepool, and nine hands lost. After the 19th the barometer bounded up again, reaching 30·115 in two days, and then fluctuated violently till the end of the month.

The mean temperature of February was 34·59, which is 3·51 lower than 38·1, the average temperature of the last ten years; the lowest point was 10° on the night of the 14th; and the highest 52° on the 24th. Wind W. 30° No.

At Seaham Harbour.—Dull and cloudy.

March.—An exceedingly raw cold month; the East wind being very penetrating. About the 26th, the wind began to waver; and by the end of the month the weather was fine and spring like. After a little movement from the 1st to the 7th, the barometer was very steady till the end; its range not exceeding three-fourths of an inch.

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The mean temperature was 37·8°; 3·16° below 40·96°, the ten years' mean. The lowest point was 24°, on the night of the 26th; and the highest 55°, on the 31st.

At Seaham Harbour.—Strong winds, squally.

April.—Fine month; barometer very steady, not ranging three-fourths of an inch throughout the whole of it.

Mean temperature 48·81, which is 3·12° above 45·69°, the ten years' average. The lowest was 30°, on the night of the 1st; the highest 69°, on the 8th. Wind So., 5° W.

At Otterburn.—Thunder from 13th to 17th.

At Seaham Harbour.—Light winds, foggy.

May.—Very fine, excepting during the second week, which was chill and rainy. The range of the barometer did not exceed one inch; gradually rising from 29·25 on the 1st, to 29·85 on 20th, when it fell as gradually to 29·3 on 29th; and then very suddenly to 28·85 on 30th. On this day severe thunder storms occurred at Allenheads, Haltwhistle, on the line of the Caledonian Railway, and in other parts of Scotland; the rain in some places falling in waterspouts.

The temperature of the month was 52·74°; 1·12° above 51·62°, the ten years' average. The thermometer was lowest on the night of the 30th, when it was 38°; and highest on the 27th, when it was 75°.

There was a good deal of rain on the three last days of the month, which brought the salmon up the Tyne in great numbers. Through the kindness of my friend, Mr. Robert Forster, of Newburn, an old and experienced salmon fisher, I am enabled to state pretty accurately the take of salmon after the flood which took place on the 30th, viz.:—

At Benwell	2
Crook	100
Bell's Close	4
Eltringham	45
Ovingham	100
Ryton	352*
Total	603

* Between midnight of 30th and midnight of 31st.

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The largest haul at Ryton took eleven fish; the largest fish was 19½ pounds; and the average weight of those at Ryton 9¾ pounds.

While on the subject of salmon I may mention, from the same reliable authority, that the following is a very close approximation to the total quantity of salmon killed in the Tyne this year:

	SALMON.	GILSE.	TROUT.
South Shields	732	187	112
Benwell	917	198	174
Scotswood and Crook	925	207	190
Blaydon, half of Crook, Newburn, and Ryton	1463	320	117
Ovingham	400	120	94
Eltringham	190	57	50
Bell's Close	200	80	70
	4827	1169	807
Average weight	9½ lbs.	3½ lbs.	2 lbs.

At Otterburn.—The Rev. Timothy Wearing reports "thunder, May 21st and 23rd. No rain here, but a waterspout at the head of the valley, on Carter Fell. I crossed some stepping-stones over the river, and in three minutes there was six feet of water over them."

At Seaham Harbour.—Changeable; lightning.

June.—A very fine month, indeed; though the want of rain was felt towards the end of it. The barometer was remarkably steady, the utmost range being one inch.

The mean temperature was 58·23°, being 1·23° higher than 57°, the ten years' average. The lowest temperature was 35°, on the night of the 11th; the highest 83·5°, on 21st, which was also the highest during the year.

At Seaham Harbour.—Light winds; fine.

July.—An exceedingly warm, fine month; with a pretty steady barometer, ranging only about one inch.

Mean temperature 60·74°; 1·83° above 58·91°, the ten years' average. The lowest was 42°, on the night of the 30th; the highest 81°, on the 26th.

Strawberries have been a failure this year, generally, in the

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North of England; and I think pears on the wall; standard apples, too, have been scanty. Gooseberries and raspberries abundant.

The beautiful humming-bird hawk-moth was very abundant this season. Over one verbena bed, about seventy feet long, I saw them continually. They remained till October; in September I counted about thirty of them at one time, hovering over their favourite bed.

At Seaham Harbour.—Thunder showers.

August.—A fine but variable month; the frequent rain caused much anxiety about the corn. Barometer very steady: variation about three-fourths of an inch.

Mean temperature 57·55°; 1·32° below 58·87°, the ten years' mean. The lowest 41°, on the nights of the 3rd and 4th; the highest 74°, on the 8th.

Salmon selling in the market at 9d. per lb.

At Seaham Harbour.—Dull and showery.

September.—One of the most splendid harvest months ever remembered; the barometer still very steady, the range being within one inch.

Mean temperature, 60·53°; 5·93° higher than 54·60°, the ten years' mean. The lowest was 35°, on the night of the 21st; and the highest 81°, on the 28th.

On the 27th, at half-past nine P.M., the barometer being very steady, after an exceedingly warm calm day, a violent gale of wind from NE. swept over this neighbourhood for about an hour. It was felt at Raby, in the County of Durham, about midnight, as well as at other places.

At Otterburn.—On the 29th, thunder.

At Seaham Harbour.—Light winds; fine.

October.—A dull cool month, with an enormous quantity of rain; 4·56 inches of which fell between the 8th and 13th; and from eight A.M. on 17th, to eight A.M. on 18th, no less than 2·30 inches; a depth of rain nearly twice as great as I ever knew to fall in twenty-four hours.

The barometer on the 1st was at 29·938, rose gently to 30·139

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on the 4th; fell gradually to 29·295 on the 9th (when the heavy rain began); continued falling gently till it reached 29·125 on the 12th; sprang up to 29·834 on the 14th; fell again to 28·918 on the 18th; and then fluctuated violently till the end of the month.

On the 10th it blew a heavy gale from SE., and several wrecks occurred. The "Medora," a collier, went to pieces at Tynemouth, and all hands were lost within a few hundred yards of thousands of spectators.

The mean temperature was 47·32°; ·48° below 48·20°, the ten years' mean. The lowest was 27°, on the night of the 28th; the highest 71°, on the 7th.

Grouse are selling at 4/6; partridges at 2/6 a brace in Newcastle. Saw the last humming-bird hawk-moth about the 19th.

At Otterburn.—On the 19th northern lights very brilliant; eclipse of the sun; stormy.

At Seaham Harbour.—Stormy.

November.—A fine month, with some heavy easterly winds, and rain. Barometer fairly steady till the 16th, when it began to fluctuate; and on the 18th, dived down from 30·012 to about 28·5 on the 22nd. There was a severe gale on the latter day, from WSW., all over England, amounting in some places almost to a hurricane.

Mean temperature 41·69°; ·67° above 41·02°, the ten years' mean. The lowest was 25°, on the night of the 12th; the highest 56°, on the 21st.

At Seaham Harbour.—Strong gales of wind.

December.—A fine month. Calm, with very little fall till the 29th, when some squally weather occurred from SSW., (which by the way is generally SSE. on the coast) causing a good deal of wreck. Barometer very steady till the 26th, when it fell suddenly till the 29th.

Mean temperature 41·98°; 2·05° above 39·93°, the ten years' mean. The lowest was 25°, on the night of the 23rd; the highest 56°, on the 31st.

At Seaham Harbour.—Fine, with strong winds.

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XVIII.—*Climatological Tables relative to Flowering of Plants, &c.*, 1865. Edited by GEORGE S. BRADY.

THE returns sent in by our contributors for the past year are unusually meagre; and as any value which these observations may possess depends, to a large extent, upon their uninterrupted continuity from year to year, we may perhaps be allowed to urge upon our members the desirability of *regularly* recording such facts as come under their notice. The printed forms issued by the Club may at all times be had on application to the secretaries, to whom they should be returned at the close of each year.

(1) *Table showing Dates of Budding, &c., of Forest Trees.*

FOREST TREES.	NORTH SHIELDS.	SEAHAM.			WHORLTON.	
	In Leaf.	In Bud.	In Leaf.	Divested of Leaves.	In Bud.	In Leaf.
Alder	.....	April 20	May 20	Oct. 20	.....	.....
Ash	May 31	April	May 26	Nov. 21	May 6	.....
Beech	May 15	April	May 21	Oct. 20	.....	April 24
Birch	May 18	April	May 20	Oct.	.....	April 30
Elm	May 18	April 1	April 30	Sept. 30	.....	April 17
Larch	.....	April 12	April 30	Oct. 11	.....	April 17
Oak	.....	May 12	May 26	Oct. 20	.....	May 6
Poplar	May 2	April 10	April 29	Oct. 10	May 12	May 27
Sycamore	May 15	April 20	April 30	Oct. 10	.....	April 16

(2) *Dates of the Flowering of the following Wild Plants growing within three miles of Tynemouth*, 1865. By JOHN COPPIN, M.A.

Tussilago farfara	Feb. 7	Viola canina	Apr. 10
Ranunculus ficaria	Mar. 24	Ribes grossularia	Apr. 18
Lamium album	Apr. 6	Prunus spinosus	May 2
Lamium purpureum	Mar. 22	Cratægus oxyacanthus	May 25
Glechoma hederacea	Apr. 8	Trifolium pratense	May 15
Veronica hederifolia	Mar. 27	Ranunculus arvensis	May 8
Veronica chamædrys	May 9	Senecio Jacobæa	July 13
Primula vulgaris	Apr. 10	Centaurea cyanus	July 13
Primula veris	Apr. 19		

(3) *Dates of the Flowering of the following Fruit Trees, Shrubs, and Plants in a Garden at North Shields*, 1865. By JOHN COPPIN, M.A.

Gooseberry	Apr. 14	Yellow Auricula	Apr. 13
Red Currant	Apr. 13	Purple Auricula	Apr. 15
Pear Tree (Jargonelle)	May 3	Blue Hyacinth	May 5
Apple Tree	May 18	Lily of the Valley	May 26
Cherry Tree	May 2	Purple Lilac	May 22
Yellow Crocus	Mar. 3	Laburnum	May 25
Purple Crocus	Mar. 13	London Pride	May 18
White Crocus	Mar. 14	Chrysanthemum	Oct. 24

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(4) *Table showing dates of Flowering of Trees and Plants.*

FRUIT TREES, SHRUBS, AND PLANTS.	STAMFORDHAM.	NORTH SHIELDS.	SEAHAM.	WHORLTON.
	In Blossom.	In Blossom.	In Blossom.	In Blossom.
Apple, Cherry, Pear, Plum (Standard Trees only.)	May 22	May 19		May 18
	May 8	May 1	May 4	May 2
	May 16	May 4	May 5	.....
	May 20	.....		May 4
Black Thorn	April 27	May 2	April 28	April 25
Bramble	.....	.....	.....	.....
Broom	June 4	May 24	.....	May 19
Currant, Black	.....	May 7	April 26	.....
" Red Flowering	.....	March 4	April 22	April 10
Elder	.....	.....	June 18	June 27
Gooseberry	.....	April 14	April 24	June 17
Hawthorn	May 29	May 25	May 27	May 28
Hazel	.....	.....	Feb. 26	.....
Honeysuckle	.....	.....	June 30	June 19
Laburnum	.....	May 25	May 26	May 26
Lilac	May 28	May 22	May 24	May 21
Mountain Ash	June 8	May 24	June 4	May 23
Privet	.....	.....	June 12	.....
Rose	.....	.....	June 12	June 17
Sallow	.....	.....	March 16	.....
Whin or Furze	April 27	March 3	April 22	June 18
Anemone	April 29	.....	April 20	April 14
Blue-bell	June 1	.....	April 20	May 8
Coltsfoot	March 31	Feby. 7	Feb. 19	.....
Dandelion	April 8	March 30	Feb. 20	April 18
Garlic	.....	.....	May 12	.....
Lily of the Valley	May 20	May 22	May 20	May 9
Primrose	April 12	April 10	March 26	April 1
Strawberry, Garden	May 30	April 29	May 6	May 17
" Wood	May 1	.....	.....	April 6
Snowdrop	Feb. 15	Feby. 2	Feby. 10	Feb. 26

(5) *Dates of Arrival and Departure of Birds.*

MIGRATORY BIRDS.	STAMFORDHAM.		NORTH SHIELDS.		SEAHAM.	
	Arrival.	Departure.	Arrival.	Departure.	Arrival.	Departure.
Black-cap	.....	.....	.....	.....	June	Aug. 25
Chiff-chaff	May 1	.....	.....	.....	April 11	.....
Corncrake	May 4	.....	May 4	.....	May 6	.....
Cuckoo	April 25	.....	April 24	.....	May 6	June 15
Fieldfare	Oct. 21	May 1	.....	Feb. 25	Oct. 11	May 8
Redstart	.....	.....	.....	.....	May 17	Aug. 12
Redwing	.....	.....	.....	Feb. 25	Oct. 12	.....
Starling	Reside all	the year	Seen thro'	the year	Seen thro'	the year
Swift	May 6	.....	.....	.....	May 13	.....
Swallow	April 13	.....	May 7	.....	April 25	Aug. 25
Wheatear	April 23	.....	.....	.....	April 25	.....
Whitethroat	April 16	.....	.....	.....	April 27	July 31
Woodcock	.....	.....	.....	.....	Oct. 10	April 2
Willow Wren	.....	.....	.....	.....	April 13	Aug. 16
Martin	.....	.....	.....	.....	April 30	Sept. 11
Curlew	March 3	.....	.....	.....	.....	.....
Flycatcher	June 4	.....	.....	.....	.....	.....

The Rev. J. F. Bigge writes—"Wood Pigeon cooing March 10th; Green Plover screaming March 15th; Grasshopper Warbler

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May 2nd; Thrush sings February 26th; Crows begin to build March 1st. Two Swallows and three House Martins seen at Stamfordham November 21st."

(6) *Dates of First Observation of Insects.*

INSECTS.	SEAHAM.	NORTH SHIELDS.	STAMFORDHAM.
	First seen.	First seen.	First seen.
Small White Butterfly	May 4	May 2	April 22
Orange Tip ,,	May 30	.....	May 22
Tortoiseshell ,,	May 12	.....	April 11
Holly Blue ,,	.....	.....	June 19
Cockchafer	April 6	.....	.....
Hive Bees	June 27	April 1	March 30
Humble Bees	April 7	April 1	April 7
Wasps	April 27	April 3	April 8

The Rev. J. F. Bigge remarks—"Killed ninety-six queen wasps; consequently during the summer there was scarcely a wasp to be seen. Mr. Draper says that wasps were not numerous, though many queens were seen in April and May.

The observations recorded in the Meteorological Report and Climatological Tables have this year been furnished by the following contributors:—

Allenheads and Bywell .... Mr. T. J. Bewick, Haydon Bridge.
Bingfield (Captain Orde) .....
Howick Hall (Earl Grey) .....
Lilburn Tower (E. J. Collingwood, Esq.)
Roddam Hall (Wm. Roddam, Esq.)....
Glanton Pike (F. W. Collingwood, Esq.)
} Communicated by the Rev. J. F. Bigge.
Cresswell ..... Henry Cresswell, Esq., Cresswell, Morpeth.
Darlington ..... Mr. John Richardson, Southend.
Gateshead .... George Wailes, Esq., Burghfield Grange.
Newcastle ..... The Literary and Philosophical Society.
North Shields ..... J. Coppin, Esq., M.A.; Robt. Spence, Esq.
Otterburn ..... Rev. Timothy Wearing. (Communicated by the Rev. R. F. Wheeler.)
North Tyne ..... Matthew Ridley, Esq., Park End.
Seaham ..... Mr. R. Draper, Seaham Hall Gardens; Mr. James Kitts, Londonderry Office.
Stamfordham ..... Rev. J. F. Bigge.
Sunderland ..... Rev. Geo. Iliff, The Hall; J. W. Mounsey, Esq., Hendon Hill.

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Wallsend ..... J. W. Dees, Esq.
Whitley..... ..... Rev. R. F. Wheeler.
Whorlton, Teesdale ..... T. Dodgson, Esq., Stubb House.
Wolsingham ..... Wm. Backhouse, Esq., St. John's.
Wylam ..... G. C. Atkinson, Esq., Wylam Hall.

XIX.—*Entomological Notes for the Year* 1865. By Thomas John Bold.

The Red Admiral Butterfly.—I see that this beautiful creature is very common this year all over our district. I have seen it at Gibside, Axwell, Gosforth, South Shields, Whitley, Hartley, &c., &c. It is very pretty to see half-a-dozen or so seated at one time on the Ragwort, a sight not at all uncommon on the sea banks north of Whitley. The small Tortoise-shell Butterfly also is just now exceedingly abundant, at the north end of Whitley sands, where it is feeding on the flowers of the sea rocket.

The Painted Lady Butterfly.—A good number of the Painted Lady Butterfly (*Vanessa Cardui*) have been on wing lately, and at present the larvæ may be found rather plentifully on thistles. They feed on a broad leaved thistle, are solitary in their habits, each living underneath a neat silken tent, of which five or six may be found on one leaf, but a few inches apart. The larva is black, very spiny, some of the dorsal spines being yellow, or brownish-yellow.

Humming Bird Hawk Moth.—In common with other localities, we have this year had an abundance of *Macroglossum stellatarum*, and any one wishing for the larva may now find them wherever their food-plant, the yellow ladies bed straw, grows. During the day the larva will be found buried in the sand at the roots of the plants, only coming abroad to feed during very dark days, and at nights.

Celery and Parsnip Leaf Miner.—Conspicuous amongst the ravages of hosts of insect pests this year, is the work of the larva

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of a beautiful fly, which is figured by Curtis, in his "Insects Injurious to Agriculture." This larva mines the leaves of celery and parsnips in large blotches; and so abundant are they, this year, that it is very difficult to find any of either plant without withered tops, from their ravages.

Bembidium 4-signatum, a new British Beetle.—One of my most interesting local additions, this year, is a pretty small thing, the *Bembidium* (*Tachys*) *quadrisignatum*, Dufts.,—Sturm Insecten vi., Pl. CXL. c. Jacq. du Val. Ann. de la Soc. Ent. de France 1852, 195. E. C. Rye, Ent. Ann. 1866, 61, 4. It is one of our smallest Geodephaga, rather like *B. bistriatum*, but differs in being more glossy, with more acute hinder angles to the thorax, and the striæ of its elytra are more deeply impressed and punctured. Jacquelin Duval, l.c., states that it has occurred in France (principally in the south), Switzerland, Austria, Germany, Sicily, the Cacausis, and also in Algeria. Rather an extensive range for so small a creature.

Capture of Myrmica lobicornis.—This ant, which is so rare, that previous to my captures, not more than half-a-dozen specimens were to be found in British collections, has this year turned up in our district. It appears to be littoral in its habits, and lives in small communities, beneath stones, on the sloping sand-banks. I found one female, and two workers, near South Shields, in April. Eight others, also neuters, were taken in August, near Whitley. A solitary individual, of the same sex, is from Blyth. Next year I hope to find males, which, I believe, have not yet been found in Great Britain.

Note on the Scarcity of Wasps.—Have wasps been abundant any where during the summer? Around Newcastle they, or rather the females, were very abundant during April, and up to the middle of May, when they suddenly disappeared, and now it is rare indeed to come across one of any sex. I have only seen two nests the whole season, and these were in the ground, at Gosforth.

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Capture of a Rare Spider at Gosforth.—When sweeping some withered grass, in Gosforth woods, on the 18th of this month (September), I caught a large female of *Epeirus scalaris*, a very beautiful spider, which is figured in Walton's British Spiders, Plate XXIV, fig. 240, and which has not hitherto been found in the North of England.

Rapacity of a Spider.—In coming to town one morning in July last, I noticed a good sized moth fluttering across the foot-path. It was a *Noctua*, and looking closely to it I found that there was good ground for its alarm, for a small brown spider (with a body not so large as a small pea) was mounted on its back. Grasping the thorax of the moth with its legs, the vampire had its fangs buried in the neck of the moth, and was so intent on its prey, that I boxed both without its quitting it. Looking into the box a few hours after, I found the moth dead, and the spider spinning a shroud over it.
—*Long Benton, September 27th*, 1865.

XX.—*On the Fossils of the Marl-slate and Lower Magnesian Limestone* (*Durham, No.* II). By JAMES W. KIRKBY.

IN a former paper, published in the Transactions of the Tyneside Naturalists' Field Club, I noticed the occurrence of several species of fossils in the lower beds of the Permian series, at Hartley's Quarry, Sunderland. As I have since found additional species in that locality, I propose to emend the list of species formerly given as occurring there, and to notice some other localities in the Lower Magnesian Limestone of North Durham, where fossils have lately been discovered. There are no new species to describe in doing this, my object being merely to contribute a little towards a better understanding of the distribution of those already known.

As this communication will probably be followed by others having reference to the fossils occurring in the lower beds of the Magnesian Limestone, in localities more to the southward, as

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well as to those species that are found in the sub-formations higher in the Series, notice will be taken of one or two localities where fossils have been obtained from the Marl-slate, which underlies the Lower Limestone.

MARL-SLATE.

Cullercoats.—During the past year (1865) a remarkably fine series of fish have been procured by Mr. Thomas Atthey, from the outlying bit of Marl-slate in the bay at Cullercoats. The position of this piece of Permian strata is of course on the north or dip side of the 90 fathom dyke, to which it in fact owes its preservation. It lies between tide marks, and is not easily examined. I know of no other locality that has produced so good a collection of these fossils, either in respect to the quantity of species, or the quality of specimens, but this may in a great measure be owing to it having been searched by one of the best observers and manipulators in the North. Some of the specimens are probably the most perfect of the species yet discovered, and may ultimately assist in completing the descriptions already published.

LIST OF SPECIES.

PYGOPTERUS MANDIBULARIS, *Agassiz.*

Two very fine examples of this species have been found by Mr. Atthey. One is 26 inches in length, and of a slender and elegant form: it shows the caudal, anal, dorsal, ventral, and pectoral fins; also the interspinous bones, those of the head and the teeth. This specimen is remarkably well preserved, and probably the most perfect individual of the species that exists. The other is only 15 inches long, and of greater relative width or height.

PLATYSOMUS STRIATUS, *Agassiz.*

A single fine specimen, 9 inches long, and 4 inches high, with the tubercular teeth well exposed.

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PALÆONISCUS COMPTUS, *Agassiz*.

Common. Occurring in various postures—sometimes strongly arched, at others straight. The largest examples are from 10 to 12 inches in length.

PALÆONISCUS ELEGANS. *Sedgwick*.

Common.

PALÆONISCUS MACROPTHALMUS, *Agassiz*.

Not rare.

PALÆONISCUS GLAPHYRUS, *Agassiz*.

Four or five specimens of this rare form are in the collection of Mr. Atthey. They are from 1½ inch to 1¾ inch long. Carelessly examined, they might be mistaken for the young of the preceding species, from which however they can be easily distinguished by their large scales. From *Pal. varians*, which it more closely approaches, this species differs in the coarse serrations of the posterior margin of its scales. One of the smallest specimens differs from the others in being very narrow, and in gradually attenuating backwards from a relatively large head.

PALÆONISCUS LONGISSIMUS? *Agassiz*.

A single specimen, which appears to belong to this species. It is nearly 8 inches long, and scarcely more than 1 inch high.

ULLMANNIA SELAGINOIDES, *Brong*.

Not common, and very imperfect.

CALAMITES, sp.

A fragment of an undoubted Calamite, showing one articulation, and having rather fine ribs, has been found by Mr. Atthey. It has some resemblance to the specimens found associated with *Ullmanniæ* and small *Palæonisci* in the Upper Magnesian Limestone, at Fulwell; and also, like them, to some of the species of the Coal Measures.

Along with the preceding forms there has occurred a curious fragment of wood. It is about 8 inches long by 4 inches wide;

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and seems, before fossilization, to have had numerous shells attached to it. Most of the traces of the latter are so obscure as not to be determinable. Possibly they may be *Lingulæ;* but with them are two or three well defined specimens of *Gervillia antiqua*, as well as something resembling *Spirorbis microconchus*.

This locality is as it were the *ultima thule* of the Marl-slate and its fossils—just as the adjoining quarry at Whitley is that of the Magnesian Limestone and its fossils. These outliers form the most northerly fossiliferous rocks of the Permian period in Britain, assuming the sandstones and breccias north of the Solway to be without fossils. It would be useless speculating as to how much further north the strata to which they belong originally extended, though the existing evidence favours the idea that they ranged in that direction far beyond their present limits. Certainly there is none of that obscurity about the manner in which the Magnesian Limestone terminates to the north as there is in respect to the south. No portions of the Series, where last seen in Durham and Northumberland, show the least traces of becoming sandy and argillaceous, like the Magnesian Limestone of Derbyshire and Nottinghamshire. Nor do the fossils of these two localities indicate any approach to a change either in the distribution of species, or in their individual peculiarities, similar to that observed in the south. Indeed it is quite clear that the northern termination of the Magnesian Limestone is abrupt and owing to denudation, like the whole of its western edge from Northumberland to Nottinghamshire.

I may here mention, that at the south end of Whitley sands, about a mile further north, there is a large boulder of Magnesian Limestone that has been washed out of the Till. It is full of fossils, but as it appears to have belonged to the middle portion of the Series, I shall refer to them afterwards. Its occurrence, however, as a boulder from the Till, points to the existence of Magnesian Limestone north of its present limits so recently as the Glacial period.

Fulwell Water Works, &c.—The Sunderland and South Shields Water Company, at the Fulwell works, have penetrated the

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Marl-slate in the wells and drifts which have been excavated there. Through the courtesy of the directors, I had an opportunity of carefully splitting and examining a portion of a large quantity that had been brought to bank; but I met with comparatively few fossils. The species found are *Palæoniscus comptus*, Ag., *Pal. elegans*, Sedg., *Pal. macropthalmus*, Ag., *Pygopterus mandibularis?* Ag., *Ullmanina selaginoides*, Brong., and *Lingula mytiloides* (*Credneri*), Sow., besides numerous fragments of coprolitic matter, and a few of vegetables showing an obscure microscopic structure. I only met with a single example of the *Lingula*.

At Hartley's Quarry, Sunderland, I have before noticed the occurrence of most of the preceding species in the Marl-slate.

At Claxheugh, in the Marl-slate exposed in the face of the river section, a specimen of *Palæoniscus comptus*, Ag., has been found by some of the members of the South Shields Geological Club. The same locality has also yielded me a good example of *Ullmannia selaginoides*, Brong.

From the Marl-slate brought to bank in sinking the two pits at the Ryhope Colliery, near Sunderland, *Pal. comptus*, Ag., *Acrolepis Sedgwickii?* Ag. (fragment), as well as the *Ullmannia*, have been obtained. This material, however, has not been well searched.

LOWER MAGNESIAN LIMESTONE.

Whitley Quarry.—This locality has almost ceased to be a fossiliferous one, owing to the lower beds that gave it this character being now covered many yards deep with water. The following list of species is thus chiefly derived from the work of Professor King.

Nautilus Freieslebeni, *Gei.*
Gervillia antiqua, *Münn.*
Leda speluncaria, *Gei.*
Astarte Vallisneriana, *King.*
Myacites elegans, *King.*
Producta horrida, *Sow.*

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Strophalosia lamellosa, *Gei.*
Camarophoria crumena? *Martin.*
Synocladia virgulacea, *Phillips.*
Stenopora columnaris, *Sch.*
Cyathocrinus ramosus, *Sch.*

Tynemouth Cliff.—As the blocks forming the conglomerate or breccia at the top of the cliff are apparently fragments of Lower Limestone, I give a list of the species that Professor King obtained from this locality.

Pleurotomaria antrina, *Sch.*
Clidophorus costatus, *Brown.*
Gervillia keratophaga, *Sch.*
Monotis speluncaria, *Sch.*
Pecten pusillus, *Sch.*
Terebratula saccula (elongata), *Mart.*
Athyris Roysii (pectinifera), *L. Eveille.*
Spirifera alata, *Sch.*
Spiriferina cristata, *Sch.*
Camarophoria globulina, *Phillips.*
———— crumena (Schlotheimi), *Mart.*
Streptorhynchus pelargonata, *Sch.*
Strophalosia Goldfussi, *Mün.*
———— lamellosa, *Gei.*
Producta horrida, *Sow.*
Cyathocrinus ramosus, *Sch.*
Ichthyorachis anceps, *Sch.*
Synoclacia virgulacea, *Phillips.*
Fenestella retiformis, *Sch.*

Westoe (*Old Wall*).—In an old wall to the east of Westoe, which is built of Lower Limestone, I have collected several species of fossils. The limestone is yellow and thin-bedded, some of the blocks splitting easily, others being hard, compact, and with a flinty fracture. Coarse grains of rounded quartz are scattered pretty plentifully through some of the limestone. Though I have not succeeded in finding the quarry whence the stone composing this wall was taken, it must evidently have

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existed somewhere in the neighbourhood. Several quarries appear to have been formerly wrought to the W. and NW. of the village, on the outcrop of the Magnesian Limestone; but most of them are not filled up or otherwise hidden from inspection. From the character of the stone of the Westoe wall, it would seem to have lain near to the base of the Lower Limestone, and, probably, not far removed from the incoherent yellow sand of the Lower Red Sandstone. In some blocks the fossils are very abundant, more particularly one species, *Strophalosia lamellosa*, Geinitz, which occurs in a dwarfed or young state more plentifully here than in any other locality I am acquainted with. Most of the specimens are in the state of casts, and many of them are considerably under their usual size.

REMARKS ON THE SPECIES.

1. TURBO HELICINUS, *Schlotheim*.

Rare. Form with roundish whorls and delicate ribs.

2. GERVILLIA ANTIQUA, *Münster*.

3. GERVILLIA KERATOPHAGA, *Schlotheim*.

Not uncommon. These two species occur slightly dwarfed.

4. EDMONDIA ELONGATA, *Howse*.

A single specimen, rather more than $\frac{1}{8}$th of an inch in length.

5. SOLEMYA BIARMICA, *De Vern*.

One specimen $\frac{3}{8}$ths of an inch long, nearly perfect, though a little distorted by pressure.

6. CLIDOPHORUS COSTATUS, *Brown*.

One or two small specimens.

7. PECTEN PUSILLUS, *Schlotheim*.

A single valve of a small specimen.

8. LEDA SPELUNCARIA, *Gei*.

An anterior half of a cast showing one or two teeth. A larger

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(more than an inch in width) imperfect specimen appears also to belong to this species.

9. STROPHALOSIA LAMELLOSA, *Gei.*

Very common; gregarious. Varying from less than $\frac{1}{8}$th to $\frac{1}{2}$ an inch in width; the great majority young individuals, and only about an $\frac{1}{8}$th wide. All with a strongly impressed, semilunar scar of attachment on ventral valve, which in the dorsal valve of course appears as a similarly shaped elevation. In young examples the semilunar scar forms fully half the shell. The radiating, raised striæ are well seen, and most of the specimens are strongly marked concentrically with lines of growth.

10. TEREBRATULA SACCULA (ELONGATA), *Mart.*

Rare.

11. PHYLLOPORA EHRENBERGI, *Gei.*

Rare.

12. FENESTELLA RETIFORMIS, *Sch.*

Not uncommon as fragmentary impressions.

12. ICHYTHORACHIS ANCEPS, *Sch.*

Common as impressions. Variety with short pinnules.

13. STENOPORA COLUMNARIS, *Sch.*, with *var. Buchiana, King.*

Not uncommon; the latter attached to shells.

14. KIRKBYA PERMIANA, *Jones.*

15. CYTHERE NUCIFORMIS, *Jones.*

16. BAIRDIA CURTA (PLEBEIA), *McCoy.*

Specimens of Entomostraca are not uncommon in some of the slabs of limestone, and there are probably more species than the three named above, though these are all I have been able to determine.

17. DENTALINA PERMIANA, *Jones, var. Kingi.*

Rare.

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18. TROCHAMMINA PUSILLA, *Geinitz.*

Common, as good casts of both the flatly oval and cylindrical forms of the species.

About three-quarters of a mile to the eastward of the last locality, in the Lower Limestone that underlies the Middle or Pseudobrecciated Limestone, on the west side of Frenchman's Bay, I have met with a few fossils, only two of which are determinable. These are *Leda speluncaria*, and *Spirifera Urii*.

In another locality in this district, just on the outcrop of the limestone to the NW. of Westoe, a few species have been found by Messrs. Wright, Howse, and Lyall, of South Shields. Through the courtesy of the two latter gentlemen (Messrs. Lyall and Howse) I am permitted to remark, that the most common fossil found was the *Chondrites virgatus*, Münster, or *Polysiphonia Sternbergiana*, King. This species was very abundant, and many of the specimens have the filamentary process finely preserved, while others are entirely denuded of them. There were also associated the obscure vegetable fossil *Zonarites digitatus*, Geinitz, and probably the remains of other plants, together with the brachiopod *Spirifera Urii* (*Martinia Clannyana*), Fleming.

Though the occurrence of these two plants has not been often noticed, I have observed them in several beds of the Upper Limestone on the coast, between Marsden and Souter Point, usually in a more imperfect condition than at Westoe. *Axinus dubius* occurs with them. Near to Black Hall Rocks they are found thickly strewed over the surface of a whitish laminated limestone, associated with *Axinus dubius*.

Hartley's Quarry.—Since 1864 the limestone exposed in the SE. face of the quarry has been wrought to some extent.* The mottled grey, massive limestone (No. 8 of Section, Trans. Tyn. Nat. Field Club, Vol. VI, p. 213) there thickens considerably and rises to the surface, the deposit of tufa-like limestone (No. 7) thinning completely out in that direction. It (No. 8) also in

* I ought to acknowledge the courtesy of James Hartley, Esq., M.P., in granting me access to this locality.

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its upper portion passes by modification into an even light grey, sub-saccharine limestone, and into a vesicular, smoke grey limestone. In these limestones, or in the three phases of the one, I have found fossils, most of which are better preserved than those in the soft limestone or marl (No. 5) noticed in my former paper, and several of which do not occur in that bed. The *Chonetes* is particularly abundant in a testiferous state. *Producta horrida* also occurs very plentifully in the vesicular limestone.

LIST OF SPECIES.

NAUTILUS FRIESLEBENI, *Geinitz*.

Fragments of individuals from 1½ to 2 inches in diameter. Rare.

TURBO HELICINUS, *Schlotheim*.

Rare.

CHEMNITZIA ROESSLERI, *Geinitz*.

A single impression.

PECTEN PUSILLUS, *Sch*.

Of fair size; in single valves. Rather rare.

ASTARTE VALLISNERIANA, *King*.

Generally imperfect, both as casts and impressions. Hitherto had only occurred at Whitley.

GERVILLIA ANTIQUA, *Münster*.

Not rare.

GERVILLIA KERATOPHAGA, *Sch*.

Rather rare.

CLIDOPHORUS COSTATUS, *Brown*.

Not rare.

TELLINA DUNELMENSIS? *Howse*.

A single valve, about $\frac{1}{16}$ths of an inch long, strongly resembling the species to which it is referred.

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MONOTIS SPELUNCARIA, *Sch.*

Specimens imperfect; seem to have been about 1¼ inch long. Rare.

AXINUS DUBIUS, *Sch.*

An inch or more in length; in separate valves; always fractured by pressure prior to fossilization. Not rare.

SOLEMYA BIARMICA, *De Verneuil.*

Specimens large, 1¾ inch long; usually fragmentary, and fractured like preceding species.

PRODUCTA HORRIDA, *Sowerby.*

Two inches long, 1–1¼ inch wide; similar to the narrow variety from Whitley; testiferous. Common.

STROPHALOSIA GOLDFUSSI, *Mün.*, *var.* EXCAVATA.

About an inch in length and width. Common.

STROPHALOSIA LAMELLOSA, *Geinitz.*

Not common.

TEREBRATULA SACCULA (ELONGATA) *Martin.*

Rare.

BAIRDIA CURTA, *M'Coy*, *var.* PLEBEIA.

ICHTHYORACHIS ANCEPS, *Sch.*

Rare.

STENOPORA COLUMNARIS, *Sch.*

TROCHAMMINA PUSILLA, *Gei.*

CHONETES HARDRENSIS, *Phillips.*

Though the many specimens of *Chonetes* found in Hartley's Quarry vary greatly in relative length and width, there is nevertheless now no good character by which to distinguish them from the common Carboniferous fossil to which Mr. T. Davidson and myself have referred it. The radiate striation, concentric lines

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of growth and cardinal spines, traces of which were noticed in the casts from stratum No. 5 (Trans. Tyn. Nat. Field Club, Vol. VI, p. 217) are all beautifully shown in the testiferous specimens lately obtained. And I can scarcely doubt that the species described from the German Zechsteins, by Baron von Schauroth, under the name of *C. Davidson*,* will ultimately be found to be identical with this, though perhaps both it and its English congeners may, as that author points out, present considerable latitude in individual modification.

The grey limestone (No. 8) extends into the adjoining Millfield Quarry. Mr. J. J. Urwin obtained there *Chonetes Hardrensis*, *Solemya biarmica*, and *Gervillia keratophaga*. It was probably from the same bed in this quarry that Professor King obtained *Pro. horrida* and a few other fossils mentioned in his Monograph of Permian fossils.

Pallion.—In 1864 an excavation was made on the estate of Mr. C. Webster, at Pallion, about a mile W. of Sunderland, in a field a little to the east of the Hall. At the depth of a few feet from the surface a limestone was reached containing fossils. The rock is yellow, vesicular, tough, apparently massive, and contains many small crystals of carbonate of lime. It appears to dip below the strata of Lower Magnesian Limestone exposed in the adjoining quarry (to the east), where a series of thin bedded, grey, yellow, and brown limestones have been wrought for the last sixty years or more. From enquiries made of workmen formerly employed in the quarry, when it was wrought at a considerably greater depth than now, as well as from the appearance of the Lower Red Sandstone at the surface in a little dene a short distance to the west, there cannot be much doubt of this limestone being very near to the base of the Magnesian Limestone. The excavation I believe is now filled up again. The following species were obtained from a few fragments of the stone.

CHITON LOFTUSIANUS, *King*.

An imperfect intermediate plate.

* Zeitschr. d. deutschen geologischen Gesellschaft Jahrg., 1856, p. 222, Pl. XI, f. 1.

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PLEUROTOMARIA ANTRINA, *Sch.*

Small, and testiferous.

TURBO HELICINUS, *Sch.*

Typical form, with large body whorl.

ARCA STRIATA, *Sch.*

Typical form, small.

GERVILLIA ANTIQUA, *Mün.*

Rather dwarfed.

MONOTIS SPELUNCARIA, *Sch.*

A small convex valve.

PRODUCTA HORRIDA, *Sow.*

Small.

STROPHALOSIA LAMELLOSA, *Gei.*

TEREBRATULA SACCULA (ELONGATA), *Mar.*

SERPULITES ANASTOMOSIS, *Kby.*

A fragment, about $\frac{5}{8}$ths of an inch long, and $\frac{3}{16}$ths of an inch wide.

STENOPORA COLUMNARIS, *Sch.*

TROCHAMMINA PUSILLA, *Gei.*

Most of the specimens are casts, one half of them are less than the usual size of their species, and none are plentiful.

More than forty years ago a very fine example of *Platysomus striatus*, Agassiz, was found in Pallion Quarry. This specimen is now in the Sunderland Borough Museum; and the rock forming the matrix of the fossil is a yellow, hard, massive limestone, somewhat resembling that from which the above species were obtained. It contains numerous specimens of *Spirifera Urii* (*Clannyana*), Fleming, and *Producta horrida*, Sow.

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Claxheugh.—Less than a mile westward, in the railway cutting at Claxheugh, is another fossiliferous locality in the Lower Limestone. It may be remarked that the greater proportion of the limestone exposed in this cutting belongs to the middle member of the Series, which here also contains fossils. But towards the west end of the cutting a rise fault to the west* brings into section the Lower Limestone. The base of this rock is not seen in the cutting, though in the old river bluff, a stone's throw to the north, where it is only ten or twelve feet thick, and unfossiliferous, its junction with the Marl-slate is very clearly shown. In the cutting it is yellow, compact, and thin bedded. Fossils are pretty plentiful in some of the thinner beds. Certain surface-planes are strewed with *Chondrites virgatus*, Mün., interspersed with large *Spirifera Urii*, Flem., and *Chonetes Hardrensis*. *Strophalosia lamellosa*, Gei., similar in growth and condition to the Westoe specimens, is also very common.

LIST OF SPECIES.

CLIDOPHORUS COSTATUS, *Brown.*

GERVILLIA ANTIQUA, *Mün.*

SPIRIFERA URII (CLANNYANA), *Flem.*

Common.

STROPHALOSIA LAMELLOSA, *Gei.*

Common.

STROP. GOLDFUSSI, *Mün.*

CHONETES HARDRENSIS, *Phillips.*

Common.

CYTHERE JONESIANA, *Kby.*

DENTALINA PERMIANA, *Jones.*

CHONDRITES VIRGATUS, *Mün.*

Common.

* Mr. R. Howse first drew my attention to this fault.

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Offerton.—About two miles further to the SW., on the north flank of the ridge running westward to Pensher Hill, and near to the village of Offerton, there are three old quarries, or "sand holes," showing a small though comprehensive section of the lower strata of the formation. In the two to the east a great deal of the section is masked by rubbish; but five or six feet of Lower Limestone and Marl-slate is exposed towards the top. In the most westerly, twenty feet or more of Lower Red Sandstone is to be seen, capped by four or five feet of Marl-slate. The following detailed section is derived from the latter and middle holes:—

		FT.	IN.
	Slaty limestone rubble	4	0
1.	Dark grey limestone ribboned with brown, in thin beds, and with partings of laminated marl-slate	1	2
2.	Dark yellow marl-slate, with thin bands of grey subcrystalline limestone	0	6
3.	Hard chocolate-coloured limestone	0	6
4.	Hard yellow limestone with large druses of calc spar, in a single bed	0	11
5.	Brownish yellow, rather arenaceous limestone, with large druses, in a single bed	1	0
6.	Yellowish, very compact limestone	0	2½
7.	Drab and greyish marl-slate, with thin bands of hard yellow limestone	1	4
8.	Greyish drab and grey marl-slate, with a single band of yellow limestone	0	11
9.	Grey limestone	0	2
10.	Brown clay rudely laminated	0	5
11.	Chocolate-coloured limestone	0	0½
12.	Brown clay, rudely laminated	0	5
13.	Brown, drab, and grey marl-slate, with thin white seams	3	0
14.	Brownish yellow marl-slate, with white surface plates	0	5
15.	Brown and yellowish laminated clay	0	2
16.	Reddish sand, with a white layer at top	0	3
17.	Fine grained yellow sand or incoherent sandstone, full of pea-like concretions—bottom not seen	20	0

In beds Nos. 11 and 12, though more especially in the last, I found *Strophalosia lamellosa* pretty plentifully, along with

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Gervillia antiqua, *Terebratula saccula* (*elongata*), *Stenopora columnaris*, *Trochammina pusilla*, and a Bryozoan that was not determinable. The two beds in which these fossils occur may almost be said to form the base of the Magnesian Limestone proper; the next two feet or more being, as it were, passage beds from the Marl-slate to the limestone.

I would remark, that it is not every section of these two members of the Permian Series that shows so intimate an interblending as the one under notice. In many places the junction of the Marl-slate with the Lower Limestone is sharp and well marked. This is the case at Claxheugh, at Hartley's Quarry, at Fulwell (water works), at Down's Quarry, near Hetton, and at other places. By examining such sections as the latter only it might easily be thought that the break between these members is more abrupt than it really is. The intercalation of bands of Marl-slate with beds of limestone at Offerton and other places indicates, as far as the geology of the case is concerned, that the change in physical conditions took place gradually. And though, as all palæontologists are aware, the fossils of the Marl-slate form a distinct group from those of other portions of the Series, they nevertheless offer one or two facts supporting this idea. In some localities where *Lingula* and *Discina* occur in the Marl-slate, along with the more characteristic fossils of that deposit, they are found to pass up for three or four feet into the overlying limestone. And at Pallion, as already noticed, *Platysomus striatus* is also found in the limestone along with shells more properly belonging to that member (p. 196).

Rough Dean.—Four miles to the S. of the last described locality, in Rough Dean, to the SE. of Houghton-le-Spring, a similar limestone occurs in the same relative position. The section is exhibited on the north bank of the rivulet, a little to the east of the Hetton Railway. Commencing from above, it runs as follows:—

	FT.	IN.
Gravel, sand, and boulders	10	0
1. Hard, yellowish brown limestone, full of patches of calc spar, in three beds	2	10

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		FT.	IN.
2.	Thin band of limestone	0	2½
3.	Limestone, similar to No. 1	2	1
4.	A bed composed of yellow marl at top, and brown clay below	0	2½
5.	Hard, sub-crystalline, dark brown limestone, in thin beds at one place, and in one thick bed at another	1	0
6.	Soft, brown, laminated marl	0	3
7.	Dark brown limestone, very hard	0	2
8.	Soft brown laminated marl	0	5
9.	Brownish marl imperfectly laminated	0	5
10.	Yellowish brown laminated marl passing into hard grey marl-slate	0	10

The rest of the section is hidden by the debris that has fallen from above; but forty years ago, when Professor Sedgwick visited the same place, he found beneath the marls last mentioned*

	FT.
Yellow incoherent sand	20
Red and black clay	1
Yellow and light blue unctuous clay	4
Strong grey freestone passing into soft slaty micaceous sandstone at top	20

There are numerous blocks of what appears to be the grey freestone of Sedgwick lying scattered about the bottom of the dene, but I could see no traces of any of the other beds named by him. The limestone No. 1 is fossiliferous, and I obtained from it the species enumerated below.

PECTEN PUSILLUS, *Gei.*

GERVILLIA ANTIQUA, *Mün.*

STROPHALOSIA LAMELLOSA, *Gei.*

Similar in growth to the Westoe species. Common.

TEREBRATULA SACCULA (ELONGATA), *Martin.*

FENESTELLA RETIFORMIS, *Sch.*

ICHTHYORACHIS ANCEPS, *Sch.*

TROCHAMMINA PUSILLA, *Gei.*

STENOPORA COLUMNARIS? *Sch.*

* Trans. Geol. Soc., Ser. 2, Vol. III, p. 71.

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XXI.—*On Casts of Palæozoic Corals found amongst the Refuse of Alkali-works.* By HENRY B. BRADY, F.L.S., &c.

SOME time ago my friend, Mr. Archibald Stevenson, brought to me a lump of refuse picked up from the waste-heap at the Jarrow Chemical Works, which was so far different from the rest in its general appearance as to have excited his curiosity. The mass had certain characters which seemed to indicate an organic origin; but they were too obscure to admit of any very positive judgment without more opportunity of comparison than this specimen afforded. Further search set the matter at rest, bringing to light specimens of two or three species of "carboniferous" corals.

On making enquiry into the history of the refuse in which these were found, I ascertained that a quantity of "Black Limestone" had been brought into the Tyne from Ireland (Co. Dublin?) as ballast, and had been taken into the chemical works as material for the production of carbonic acid, but it was found to contain so large a proportion of matter insoluble in hydrochloric acid that it could not be used for the purpose. The "insoluble" remaining in the generators was thrown out as refuse, and the remainder of the stone was burnt for quick-lime.

Subsequently I had the opportunity of searching the heap very carefully, in company with Mr. Stevenson and Mr. D. O. Brown, and we had the good fortune to find examples of about half-a-dozen species of Carboniferous Limestone corals. Dr. Duncan has been good enough to examine these, and states that several of the specimens belong to a species of *Zaphrentis* hitherto undescribed; that the rest are well known and are as follows:—

Syringopora geniculata, Phillips.
Michelinia megastoma, Phillips, sp.
Zaphrentis caryophylloides, Edwards.
Zaphrentis cylindrica, Scouler, sp.
Lithostrotion Phillipsii, Edwards.

The specimens consist of siliceous casts of the calcareous skeletons of the corals, and they are so completely decalcified that

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they remained unaltered on a second maceration in strong acid. Chemical analysis of a fair sample of the limestone showed that it contained nearly thirty per cent. of silica, and that there were also present sensible quantities of organic matter (bituminous), free sulphur, phosphoric and sulphuric acids, and protoxide of iron.

Much fresh interest has been recently excited in the processes by which the infiltration or impregnation of organic bodies with silex takes place, in connection with the history of *Eozoön Canadense*. In the case of *Eozoön*, the sarcode or animal jelly appears to have been gradually replaced by siliceous material which has accurately filled even the minutest tubuli of the canal-system, whilst the calcareous skeleton has remained unaffected. But in the corals an opposite condition is found—the skeleton has become silicified, and we have no traces of the soft parts. Whether a certain proportion of silex was secreted with the carbonate of lime during the life of the animal, or whether its presence is entirely due to infiltration subsequently, is a question very difficult of solution.

It is well worth while, for those who have the opportunity, to keep an eye on the insoluble matters turned out of the carbonic acid generators in our chemical works. Carbonate of lime, in many of its forms, abounds in siliceous fossils, and these are left amongst the refuse thrown out; indeed, the process of chemical manufacture, as practised on the Tyne, supplies us, on a grand scale, with a means of separating organic remains, which paleontologists are prevented from employing, except in a very limited way, on the ground of expense and the want of suitable apparatus for its proper application.

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XXII.—*On the Occurrence of Bostrychia scorpioides on the Northumberland Coast.* By George S. Brady.

Some few years ago, when I paid more attention to the Algæ than I have recently done, I searched frequently, in such localities as seemed suitable, for the curious plant which forms the subject of the present notice. The search was always unsuccessful. But in September last, 1865, while examining some brackish pools at Alnmouth, for the sake of Crustacea rather than Algæ, I unexpectedly came upon a few tufts of *Bostrychia scorpioides*. And though I pounced upon it at once as a treasure long looked for, never found, I began to feel some doubts, on examining it with a pocket lens, as to whether the thing was really an Alga at all. It had so much the appearance and colour of some wretched, stunted variety of that variable plant, *Ranunculus aquatilis*, that I could not satisfy myself of its identity until I got it under the microscope at home. The few tufts which I found were all in one small pool, and lying detached on the bottom. Neither could I find any trace of their having originally grown either on the muddy margin of the pool, or on the stems of aquatic plants (plants, indeed, there were none for it to grow upon); but the filaments were tangled together in a kind of loosely-matted ball, such as we not unfrequently see in the case of fresh-water Algæ which grow unattached. Altogether my impression is, that in this case the *Bostrychia* was growing freely without having had any attachment. Though dull green in colour, it belongs to the *Rhodospermeæ* or Red Algæ, and is nearly allied to some of the commonest marine forms (*Rhodomelæ*). It is remarkable that though these red species are mostly very impatient of fresh or impure water, flourishing chiefly in deep, shaded rock pools, or in deep sea beyond low-water mark, the *Bostrychia* is found only in salt marshes or near the mouths of rivers. It has not previously been found on the eastern shores of England or Scotland, the only recorded instances of its occurrence in our islands being Ireland and the south-west of England. Its limitation to one pool out of many in the same locality, all apparently equally well suited to its growth, is curious; but perhaps further

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search might have revealed it elsewhere. Still, supposing it to be really confined to the single pool in which it was found, it only presents a parallel to the similar partial distribution of Crustacea, &c. For example, one or two pools swarmed with *Mysis vulgaris*, no other animal being visible; another was filled in like manner with myriads of a little prawn—*Palæmon varians*, while others seemed to be entirely devoted to a gasteropodous mollusc—*Rissoa Ulvæ*.

XXIII.—*On the Chemical Composition of various Beds of the Magnesian Limestone and Associated Permian Rocks of Durham.*

By E. J. J. Browell and James W. Kirkby.

Although hundreds of analyses of samples from the Magnesian Limestone formation of this district have been made at various times, and some of them, both by myself and others, have been published in various forms, there has, I believe, never been yet published anything approaching to a complete Series, representing the various sub-formations and beds known to geologists. A desire for something of the kind having been often expressed by many of our local naturalists, I undertook the chemical examination of a Series collected and arranged by Mr. J. W. Kirkby. It was intended at the outset to make the analyses more detailed and elaborate than I have ultimately done, but the number of analyses required made this departure from the original plan necessary; and after all, though more minute analyses would look more imposing, they would scarcely be of more interest to the geologist, in whose eyes the chief interest will consist in the relation of the carbonates of lime and magnesia to each other, and to the total amount of other matters (clay, &c.)
E. J. J. B.

We describe the samples analysed in the geological sequence of the strata to which they belong, commencing with the lowest.

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The stratigraphical arrangement adopted is that which is now generally accepted for the Permian strata of Durham, viz.:—

TABLE I.

	SUB-FORMATION.	LOCALITIES IN NORTH DURHAM.
Permian or Magnesian Limestone Series.	5. Upper Limestone.	Half-way House, Building Hill, Fulwell Hill, and Roker, near Sunderland; coast from Roker to Marsden, &c.
	4. Middle Limestone.	Humbleton Hill, Tunstall, Galley's Gill, &c., near Sunderland; coast for several miles south of Ryhope Dene; Trow Rocks, near South Shields; Down Hill, near West Boldon.
	3. Lower Limestone.	Hartley's Quarry, Pallion, and Claxheugh, near Sunderland; Frenchmen's Bay, Down Hill, Pensher Hill, Houghton-le-Spring, Moorsley, Pittington, Running Waters, &c.
	2. Marl-slate.	Cullercoats, Claxheugh, Offerton, Sherburn, &c.
	1. Lower Red Sandstone.	Claxheugh, Offerton, Down Hill, Down's Quarry, Sherburn, &c.

ANALYSES.

Sub-formation.—LOWER RED SANDSTONE.

Geological Characters.—A yellow or greyish, usually incoherent, and false-bedded sandstone; sometimes apparently passing into (below) a red, purple, or grey, micaceous, and comparatively hard sandstone. The first-named is essentially a quartzose rock, the grains of which are always more or less water-worn, and coated with oxide of iron; in some parts it becomes calcareous (analyses 1 and 4). In its incoherent form it is generally present below the Marl-slate, and is sometimes of considerable thickness; as at the Fulwell Water Works, one hundred and fifty feet, and Ryhope Pit, ninety-six feet; at others it is exceedingly thin, as at Wearmouth Pit, five feet, and one of the Seaham pits, three feet; and occasionally it is absent. The six analyses below are from this portion of the deposit.

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No. 1. Locality—RYHOPE PIT.

Lithological Characters (of specimen analysed). Yellow sandstone, composed of subangular pieces of quartz cemented by carbonate of lime.

ANALYSIS.

Carbonate of lime	20·48
——— magnesia	1·52
Oxide of iron and alumina	6·16
Silica soluble in dilute acid	0·16
Sand, clay, &c.	72·88
	101·20

Remarks.—The specimen is from the upper portion of the deposit, near to the Marl-slate.

No. 2. Locality—RYHOPE PIT.

Lithological Characters.—Yellowish grey, incoherent sandstone, formed of coarse, well-rounded grains of quartz: might be described as an arenaceous oolite.

ANALYSIS.

Carbonate of lime	0·39
Oxide of iron	10·20
Sand, &c.	89·33
Water	0·47
	100·39

No. 3. Locality—CLAXHEUGH.

Lithological Characters.—Reddish yellow, incoherent sandstone, rather fine-grained. From near the top of the deposit (here about eighty or ninety feet thick), adjoining the Marl-slate.

ANALYSIS.

Carbonate of lime	0·85
——— magnesia	0·33
Oxide of iron and alumina	5·13
Sand and clay	92·13
Water	1·53
	99·97

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No. 4. Locality—CLAXHEUGH.

Lithological Characters.—Fine-grained, yellow, incoherent sandstone. From the middle of the deposit.

ANALYSIS.

Carbonate of lime	6·72
——— magnesia	1·20
Oxide of iron and alumina	1·28
Sand and clay	86·72
Water	4·08
	100·00

No. 5. Locality—CLAXHEUGH.

Lithological Characters.—Yellow, fine-grained, (mixed with large rounded grains) incoherent sandstone. From the middle of the deposit.

ANALYSIS.

Carbonate of lime	2·32
——— magnesia	1·58
Oxide of iron and alumina	4·33
Sand and clay	91·00
Water	1·24
	100·47

No. 6. Locality—CLAXHEUGH.

Lithological Characters.—Reddish yellow, and grey, oolitic-like, incoherent sandstone, nearly resembling No. 2. From about the middle of the deposit.

ANALYSIS.

Carbonate of lime	0 64
——— magnesia	0·43
Oxide of iron and alumina	11·46
Sand and clay	86·20
Water	0 52
	99·25

General Remarks.—It will be seen that all the samples of this deposit contain more or less carbonate of lime—in one case even

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twenty per cent. Five out of the six also contain carbonate of magnesia. We are rather inclined to ascribe the presence of both to natural deposition along with the siliceous (and other) materials, though they may be due to infiltration from the overlying limestone. But we have seen a similar Permian rock at Knaresbro', in Yorkshire, so highly calcareous, (passing gradually on the one hand into pure magnesian limestone, and on the other into a true sandstone,) as to have been mistaken and described for a limestone. The lime in this rock must evidently have been deposited.

The chief and almost only economic value of this deposit consists in the storage it affords for a large supply of good water. Its absorbent properties are well known, both from the money it has lost, as well as the money it has gained enterprising speculators for coal or water, as the case may be. We have made a few experiments on the quantity of water which the sandstone is capable of holding, the results of five of which are given in the following table :—

TABLE II,

ILLUSTRATIVE OF THE ABSORBENT PROPERTIES OF THE LOWER RED SANDSTONE.

No.	LOCALITY.	Weight of a cub. ft. of Sandstone, dry.	Weight of a cub. ft. of Sandstone, wet.	Water absorbed by a cub. ft. of Sandstone.
		lbs.	lbs.	lbs.
1	Claxheugh..	108·0	120·5	12·5
2	Fulwell	155·37	161·50	6·13
3	——— ...	125·3	135·56	10·26
4	———	121 93	134·12	12·19
5	———	118·75	131·25	12·50

The third column represents the weight of the sandstone stove-dried; the fourth column the weight of it thoroughly saturated.

Some idea of the enormous supply of water that may be (and evidently is) thus stored in this rock may be obtained by calculating the quantity absorbed by a square mile of it (say fifty feet thick, at the rate of ten pounds or a gallon per cubic foot), which gives 1,393,920,000 gallons. Fifty such miles, which may be

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taken as the area of the Lower Red Sandstone in North Durham, would give 69,696,000,000 gallons, or thirty-eight years' supply, at 5,000,000 gallons per day.

As a building stone, that portion of the deposit from which the samples analysed were taken, is of no use, though the lower micaceous beds are occasionally quarried for that purpose. The presence of oxide of iron prevents it being employed in the manufacture of glass.

Sub-formation—MARL-SLATE.

Geological Characters.—A yellow and grey, well laminated calcareous shale or slate—sometimes hard and ringing under the hammer, but generally soft and somewhat tough: fossiliferous. It varies in thickness from two feet to nearly ten feet, and is almost invariably found between the limestone and the Lower Red Sandstone in Durham.

No. 7. Locality—RYHOPE PIT.

Lithological Characters.—Dark grey (commonly called blue) softish Marl-slate, containing the scales of *Palæoniscí*. Lowest laminæ.

ANALYSIS.

Carbonate of lime	16·64
——— magnesia	12·56
Oxide of iron and alumina	3·76
Silica soluble in dilute acid	2·00
Sand, &c.	45·12
Water, &c.	19·92
	100·00

No. 8. Locality—RYHOPE PIT.

Lithological Characters.—Grey, hard, and almost sub-crystalline, laminated Marl-slate, containing a small vein of calcite, with crystals of iron pyrites. Upper laminæ.

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ANALYSIS.

Carbonate of lime	49·06
——— magnesia	36·40
Oxide of iron and alumina	2·93
Silica soluble in dilute acid	0·46
Sand, &c.	5·53
Water, &c.	4·40
	98·78

No. 9. Locality—RYHOPE PIT.

Lithological Characters.—Greyish, approaching yellow, rather hard, laminated Marl-slate, containing scales of *Palæonisci*. Highest laminæ.

ANALYSIS.

Carbonate of lime	48·48
——— magnesia	30·16
Oxide of iron and alumina	4·32
Silica soluble in dilute acid	0·80
Sand, &c.	13·28
Water, &c.	2·96
	100·00

Iron chiefly as protoxide. A little organic matter.

No. 10. Locality—MIDDERIDGE.

Lithological Characters.—Yellowish grey, moderately hard Marl-slate.

ANALYSIS.

Carbonate of lime	41·28
——— magnesia	15·68
Oxide of lime and alumina	12·64
Silica soluble in dilute acid	2·08
Sand and clay	21·60
Water, &c.	6·72
	100·00

No. 11. Locality—FULWELL WATER WORKS (SHAFT OF).

Lithological Characters.—Dark grey Marl-slate. Lowest laminæ, close to the Lower Red Sandstone.

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ANALYSIS.

Carbonate of lime	24·86
——— magnesia	12·70
Oxide of iron and alumina	7·00
Silica soluble in dilute acid	0·33
Sand and clay	40·53
Water, &c.	13·33
	98·75

No. 12. Locality—CULLERCOATS

(BETWEEN TIDE MARKS).

Lithological Characters.—Dark grey, hard, laminated Marl-slate.

ANALYSIS.

Carbonate of lime	25·26
——— magnesia	13·31
Oxide of iron and alumina	7·60
Sand and clay	29·53
Water, &c.	25·00
	100·70

Iron almost all protoxide. Trace of manganese.

No. 13. Locality—FERRY HILL.

Lithological Characters.—Brownish grey Marl-slate; containing *Lingulæ.*

ANALYSIS.

Carbonate of lime	37·13
——— magnesia	26·12
Oxide of iron and alumina	3·73
Sand and clay	24·20
Water	6·85
	98·03

No. 14. Locality—RYHOPE PIT.

Lithological Characters.—Yellow, laminated Marl-slate, adjoining the limestone.

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ANALYSIS.

Carbonate of lime	48·40
——— magnesia	39·58
Oxide of iron and alumina	3·26
Silica soluble in dilute acid	0·26
Sand, &c.	7·80
Water	1·05
	100·35

Iron chiefly as protoxide. Trace of organic matter.

No. 15. Locality—RYHOPE PIT.

Lithological Characters.—Grey sub-crystalline limestone, from a half-inch band that occurs in the upper part of the Marl-slate.

ANALYSIS.

Carbonate of lime	52·06
——— magnesia	38·89
Oxide of iron and alumina	4·66
Sand, clay, &c.	1·73
Water	0·80
	98·14

Iron chiefly as protoxide. Traces of organic matter and manganese.

No. 15A. Locality—RYHOPE PIT.

Lithological Characters.—Brown laminated marl or clay, from an inch band that lies between the Marl-slate and the Lower Red Sandstone.

ANALYSIS.

Carbonate of lime	1·78
——— magnesia	1·46
Oxide of iron and alumina	9·33
Sand and clay	76·26
Water	9·92
	98·75

Traces only of iron as protoxide. Trace of manganese.

The Marl-slate is evidently a transition deposit from the siliceous rock below to the magnesio-calcareous ones above. Near

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to the sandstone silica and alumina are its prevailing constituents (Nos. 7, 11, and 12): nearer the limestone carbonates of lime and magnesia form more than five-sixths of its bulk (Nos. 8, 9, and 14.

It is of no economic value.

Sub-formation.—LOWER LIMESTONE.

Geological Characters.—Of various shades of yellow (prevailing tint), brown, grey, and sometimes whitish; generally compact, often sub-crystalline, occasionally vesicular, rarely friable and tufaceous; frequently thin-bedded, though ranging from strata an inch thick to others of two feet and upwards, but almost invariably well stratified; fossiliferous in some of its beds. Aggregate thickness from two hundred to two hundred and fifty feet. Largely distributed on the western side of the formation.

No. 16. Locality—SUMMERHOUSE,

TWO MILES N. OF THE TEES.

Lithological Characters.—A grey, rather compact and hard, thin-bedded limestone; fossiliferous.

ANALYSIS.

Carbonate of lime	56·40
——— magnesia	38·88
Oxide of iron and alumina	0·80
Sand and clay	1·36
Water	2·56
	100 00

Forms a moderate road metal; is also burnt for lime.

No. 17. Locality—EAST THICKLEY,

THREE MILES S.E. OF BISHOP AUCKLAND.

Lithological Characters.—Smoke grey, compact, and almost sub-crystalline, thin-bedded, with irregular surface planes and partings of yellowish marl; fossiliferous.*

* Described by Professor Sedgwick in his Memoir (Trans. Geol. Soc., Ser. II, Vol. III p. 76,) as beds No. 3 in the Middleridge and East Thickley section.

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ANALYSIS.

Carbonate of lime	94·88
——— magnesia	2·48
Oxides of iron, manganese, and alumina	0·96
Silica soluble in dilute acid	0·32
Sand, &c.	0·72
	99·36

No. 18. Locality—CONISCLIFF.

Lithological Characters.—Light yellow, compact, varying to sub-oolitic, massive; unfossiliferous. The most southerly locality for Magnesian Limestone in Durham.

ANALYSIS.

Carbonate of lime	66·80
——— magnesia	28·88
Oxide of iron	0·24
Water	4·08
	100·00

No. 19. Locality—RYHOPE PIT.

Lithological Characters.—Grey, compact, in thinnish beds, with irregular surface planes, and partings of dark grey shale (No. 22); unfossiliferous.

ANALYSIS.

Carbonate of lime	64·96
——— magnesia	25·12
Oxide of iron and alumina	2·72
Sand and clay, &c.	6·08
Water, &c.	1·12
	100·00

This limestone usually occurs towards the base of the Lower Limestone, though often separated from the Marl-slate by some yellow or brown beds.

No. 20. Locality—RYHOPE PIT.

Lithological Characters.—Yellow, and rather friable; soiling the fingers.

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ANALYSIS.

Carbonate of lime	39·60
——— magnesia	28·24
Oxide of iron and alumina	5·06
Sand, clay, &c.	24·06
Water, &c.	1·28
	98·24

No. 21. Locality—RYHOPE PIT.

Lithological Characters.—Brown limestone, varying from a soft earthy texture to a very compact one which fractures with sharp cutting edges. From the basal beds of the Magnesian Limestone at Ryhope, lying immediately above the Marl-slate.

ANALYSIS.

Carbonate of lime	57·12
——— magnesia	31·36
Oxide of iron, sand, clay, &c.	7·68
Water, &c.	3·84
	100·00

No. 22. Locality—RYHOPE PIT.

Lithological Characters.—Fine-grained, grey, calcareous shale, forming partings (from a quarter to one inch thick) between the grey, compact strata, No. 19. Similar partings, but of a brown colour, occur in other localities, in the same relative position.

ANALYSIS.

Carbonate of lime	4·20
——— magnesia	2·60
Silica, sand, and clay	75·93
Oxide of iron and alumina	3·46
Water, &c.	10·79
	96·98

No. 23. Locality—RYHOPE PIT.

Lithological Characters.—Yellow, compact, and marked with dendrites.

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ANALYSIS.

Carbonate of lime	54·40
——— magnesia	46·45
Oxide of iron and alumina	0·60
Sand, clay, &c.	0·13
	101·58

No 24. Locality—HOUGHTON-LE-SPRING.

Lithological Characters.—Yellowish, with white streaks, subconcretionary—the rock being irregularly compact and hard with bands and pockets of marl, thin-bedded; unfossiliferous.

ANALYSIS.

Carbonate of lime	54·66
——— magnesia	44·79
Oxide of iron, &c.	1·06
Sand	0·46
	100 97

This limestone is largely developed in the neighbourhood of Houghton-le-Spring, and along the western escarpment of the formation to the north by Pensher Hill to Down Hill, and southward by Eppleton to Moorsley and beyond. It is of considerable thickness; and has been extensively quarried and used for fences, for an inferior building stone, for road-making, and for lime-burning.

No. 25. Locality.—HASTING HILL.

Lithological Characters.—Whitish yellow, soft, and very friable, scarcely stratified; unfossiliferous. Not at all a typical rock of the Lower Limestone, but as it is within the area of outcrop of that member, we cannot but consider it an exceptional form of it.

ANALYSIS.

Carbonate of lime	50·96
——— magnesia	44·72
Water	4·32
	100·00

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No. 26. Locality—QUARRY S.E. OF PENSHER HILL.

Lithological Characters.—Yellow, ribboned with grey and speckled with brown, compact, hard, breaking with sharp cutting edges, thin-bedded; unfossiliferous.

ANALYSIS.

Carbonate of lime	91·86
——— magnesia	3·21
Oxide of iron and alumina	1·33
Sand	1·60
Water	0·85
	98·85

Iron chiefly as peroxide. Trace of manganese.

A limestone similar to this is widely distributed along the western escarpment of the formation (when it occasionally occurs of considerable thickness) from Down Hill to Sherburn, where it is extensively quarried and used for road-making, lime-burning, and for building—though it is only an inferior stone for the latter purpose. It is usually unfossiliferous, but at Sherburn, Low Moorsley, and Pallion a few fossils occur on the weathered surfaces of the beds.

No. 27. Locality—HERRINGTON HILL.

(FRIABLE VARIETY.)

Lithological Characters.—Light yellow, friable with harder sub-oolitic portions, containing small druses; unfossiliferous.

ANALYSIS.

Carbonate of lime	68·60
——— magnesia	32·00
Oxide of iron and alumina	0·46
Sand	0·13
	101·19

No. 28. Locality—HERRINGTON HILL.

(CRYSTALLINE VARIETY.)

Lithological Characters.—Yellowish grey, weathering cold grey,

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hard and highly crystalline, granular and saccharoid, massive; unfossiliferous.

ANALYSIS.

Carbonate of lime	69·84
——— magnesia	20·88
Sand	2·48
Water, &c.	6·80
	100·00

No. 29. OFFERTON,

QUARRY IN VILLAGE.

Lithological Characters.—Yellow, compact, soft, thin-bedded; unfossiliferous.

ANALYSIS.

Carbonate of lime	40·40
——— magnesia	49·22
Oxide of iron and alumina	1·73
Sand and clay	4·73
Water	2·00
	98·08

Iron chiefly peroxide.

No. 30. FULWELL,

SHAFT OF WATER WORKS.

Lithological Characters.—Yellow ribboned with grey, hard, and compact. Similar in character to No. 26.

ANALYSIS.

Carbonate of lime	81·52
——— magnesia	7·68
Oxide of iron and alumina	2·16
Silica soluble in dilute acid	1·20
Sand and clay	4·08
Water	3·36
	100·00

No. 31. Locality—HARTLEY'S QUARRY,

SUNDERLAND.

Lithological Characters.—Brown, ribboned with grey, hard and compact, thick-bedded.

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ANALYSIS.

Carbonate of lime	74·64
——— magnesia	16·16
Oxide of iron and alumina	5·28
Sand, &c.	2·64
Water	1·28
	100·00

No. 32. Locality—DOWN HILL, WEST BOLDON.

Lithological Characters.—Chocolate-coloured, earthy and sub-crystalline, irregularly-bedded; fossiliferous.

ANALYSIS.

Carbonate of lime	83·35
——— magnesia	13·86
Oxide of iron and alumina	0·75
Sand, clay, &c.	0·20
Water, &c.	1·84
	100·00

No. 33. Locality—PALLION, SUNDERLAND.

Lithological Characters.—Brown and grey ribboned, compact, and thin-bedded.

ANALYSIS.

Carbonate of lime	91·04
——— magnesia	2·24
Oxide of iron and alumina	4·56
Sand, clay, &c.	0 16
Water, &c.	2·00
	100·00

No. 34. Locality—PALLION.

Lithological Characters.—Greyish yellow, sub-crystalline, and very hard, striking fire easily with the hammer; in one thin bed.

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ANALYSIS.

Carbonate of lime	60 72
———— magnesia	35·48
Sand, clay, oxide of iron, &c.	2·60
Water	1·20
	100·00

The per centage of carbonates of lime and magnesia in these analysis of the Lower Limestone varies from 94·88 to 39·60; that of carbonate of magnesia 46·45 to 2·48. No. 22 can scarcely be called an analysis of this member, though it is that of a shale belonging to the same period of deposition.

We have already alluded to the economic uses of some of the limestones of this formation. An excellent lime for building may be obtained from most of the beds; and some of them, from the small quantity of carbonate of magnesia contained in them, would evidently form a good tillage lime. Little can be said in favour of these limestones as building stones, for as a rule they are thin-bedded, difficult to work into suitable blocks, and unable to withstand the action of the weather. There is one exception to this in a portion of the stone at Pallion Quarry, which is brownish grey, concretionary, and five or six feet in thickness It withstands atmospheric action as well as any stone we have seen. Several old houses are built of it in the neighbourhood of the quarry, and it has recently been used with success in the new church of St. Nicholas, at Sunderland.

Sub-formation.—MIDDLE LIMESTONE.

Geological Character.—Of various shades of yellow and brown; crystalline, compact, or friable; of very irregular structure, and generally unstratified; usually fossiliferous. About one hundred feet thick.

No. 35. Locality—FULWELL RAILWAY-CUTTING.

Lithological Characters.—Yellowish white limestone in the state of fine powder—called marl by quarrymen. In this softer

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material are numerous hard concretions, some of which are merely of hard limestone, others in the centre pass into a highly siliceous and flint-like substance. It is the powdery limestone only that has been analysed. Mr. R. C. Clapham has already published an account of the analysis of the siliceous concretions.*

ANALYSIS.

Carbonate of lime	42·48
——— magnesia	49·86
Sand, clay, oxide of iron	6·60
Water, &c.	1·06
	100·00

No. 36. LOCALITY—GALLEY'S GILL, SUNDERLAND.

Lithological Characters.—Grey and yellowish, hard, crystalline, with numerous irregular cavities sometimes coated with calcite; unfossiliferous.

ANALYSIS.

Carbonate of lime	95·29
——— magnesia	2·91
Sand, clay, oxide of iron, &c.	1·40
Water, &c.	0·40
	100·00

Has been extensively wrought and burnt for lime for many years. Some portions of the rock pass into a soft marl resembling No. 35; and this has been almost as largely worked as the other, and used in the manufacture of bottles on the Wear and Tyne.

The Middle Limestone is not considered to make a good tillage lime. It is generally described as being "too hot," owing to the large quantity of carbonate of magnesia it contains. This is

*ANALYSIS.

Silica	96·5
Alumina and iron	1·2
Carbonate of lime	1·6
——— magnesia	trace.
	99·3

Trans. Tynes. Nat. Club, Vol. V, p. 124.

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undoubtedly often the case, though* not always, as shown by analysis 36.

It is of little or no use as a building stone.

Sub-formation—UPPER LIMESTONE.

Geological Characters.—Yellow, brown, and grey; friable, compact, crystalline, and concretionary, the concretionary beds being very remarkable on account of the peculiar forms taken by the limestone; in strata of various thickness up to three feet; sometimes fossiliferous; two hundred and fifty feet thick and more.

No. 37. Locality—FULWELL QUARRY, SUNDERLAND.

Lithological Characters (Botryoidal limestone).—Composed of congeries of grey or yellowish crystalline, pea, or grape-like bodies, imbedded in and with the interstices filled with a yellow, impalpable powder or marl that is readily moved by weathering. A common form of the concretionary beds of the Upper Limestone both in this locality and on the coast between the Wear and Tyne.

ANALYSIS (of concretions only).

Carbonate of lime	91·95
——— magnesia	2·06
Sand, clay, oxide of iron, &c.	5·26
Water, &c.	0·73
	100·00

Nos. 38 and 39. Locality—FULWELL QUARRY.

Lithological Characters.—Small spherical concretions of a grey colour, imbedded in a light yellow matrix of soft "marl." The

* The Middle Limestone of Humbleton Hill has been analysed by Dr. Thomson, Annals of Philosophy, Vol. IV.

Carbonate of lime	51·50
——— magnesia	44·84
Insoluble matter	1·60
Loss	2·06
	100·00

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concretions and the marl, or the hard and soft portions, are analysed separately.

ANALYSIS.

	38. SOFT PART.	39. HARD CONCRETIONS.
Carbonate of lime	62·94	89·10
——— magnesia.....	33·73	8·74
Sand, clay, oxide of iron, &c...	1·93	1·53
Water, &c.....	1·40	0·63
	100·00	100·00

No. 40. Locality—FULWELL QUARRY.

(MARL OF "DUN STONE.")

Lithological Characters.—Light yellow, very soft and friable—falling to powder on exposure to the weather, with greyish concretions and druses of calc spar; unfossiliferous.

ANALYSIS.

Carbonate of lime	54·89
——— magnesia	39·85
Sand, clay, oxide of iron, &c.	2·66
Water, &c.....	2·60
	100·00

No. 41. Locality—FULWELL QUARRY.

CONCRETIONS IN MARL OF "DUN STONE."

Lithological Characters.—Greyish yellow, crystalline, with a sharp flinty fracture, and druses of calc spar.

ANALYSIS.

Carbonate of lime	80·01
——— magnesia	9·93
Sand, clay, oxide of iron, &c.	2·06
Water, &c.	8·00
	100·00

No. 42. Locality—FULWELL QUARRY.

GREAT MARL BED, TOP.

Lithological Characters.—Light yellow, very soft and friable, falling to powder on exposure to the atmosphere, with irregular

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hard crystalline and greyish concretions, and druses; unfossiliferous. Forms a thick bed about ten feet thick below the "Main or Honeycomb" stone. Is not used for any economical purpose.

ANALYSIS.

Carbonate of lime	52·10
——— magnesia	44·04
Sand, clay, oxide of iron, &c.	2·73
Water, &c.	1·13
	100·00

No. 43. Locality—FULWELL QUARRY.

GREAT MARL BED, BOTTOM.

Lithological Characters.—Similar in character to the preceding specimen.

ANALYSIS.

Carbonate of lime	55·48
——— magnesia	40·92
Sand, clay, oxide of iron, &c.	3·04
Water, &c.	0·56
	100·00

No. 44. Locality—FULWELL QUARRY.

"WHITE STONE."

Lithological Characters.—Grey, hard, and sub-crystalline, in thick beds; unfossiliferous. Forty feet thick.

ANALYSIS.

Carbonate of lime	94·89
——— magnesia	1·71
Sand, clay, oxide of iron	2·60
Water	0·80
	100·00

When burnt it forms a good lime for agricultural purposes, for which it is extensively burnt at the Fulwell and Southwick Quarries.

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No. 45. Locality—FULWELL QUARRY.

"MAIN OR HONEYCOMB STONE."

Lithological Characters.—Light grey, hard, sub-crystalline, highly concretionary, the concretions being formed (in specimen analysed) of concentric laminæ with unequal open spaces between, which are coated with yellow magnesian marl; unfossiliferous. Occurs in massive beds that form a series twenty feet thick and upwards.

ANALYSIS.

Carbonate of lime	96·55
——— magnesia	1·46
Sand, clay, oxide of iron, &c.	1·06
Water, &c.	0·93
	100·00

This limestone is considered to make the best lime for tillage in the North of England. For this purpose it is largely burnt at the Fulwell Quarries and shipped to Scotland.

It forms a building stone that resists atmospheric action; but it is difficult and expensive to dress. It has been very largely used from the Half-way House Quarries in the execution of various works, both in and out of water, at the South Docks, Sunderland. A stone of exactly similar character has been used for the Cleadon works of the Sunderland and South Shields Water Company. It was also in former times, when the site of the present Mowbray Park existed as Building Hill Quarry, extensively used in Sunderland for building purposes, though chiefly for rough walling.

Nos. 46 and 47. Locality—FULWELL QUARRY.

Lithological Characters.—Grey concretions, imbedded in soft yellow magnesian marl; unfossiliferous. This specimen forms two analyses: the grey concretions one, the marl the other.

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ANALYSES.

	46. GREY CONCRETIONS.	47. YELLOW MARL.
Carbonate of lime	95·58	56·53
——— magnesia	2·36	38·54
Sand, clay, oxide of iron, &c.	1·40	3·60
Water, &c.	0·66	1·33
	100·00	100·00

No. 48. Locality—SEA CLIFF,

A QUARTER OF A MILE S. OF MARSDEN.

Lithological Characters.—Whitish yellow, and very soft; forming a series of massive beds that attain a thickness of seventy feet and more, some of which are highly fossiliferous.

ANALYSIS.

Carbonate of lime	52·66
——— magnesia	45·35
Sand, clay, oxide of iron, &c.	0·73
Water, &c.	1·26
	100·00

The fallen blocks on the beach have for many years been shipped to the chemical works on the Tyne.

No. 49. Locality—COAST,

HALF-WAY HOUSE, RYHOPE.

Lithological Characters.—Warmish white, compact, laminated, the surface planes very smooth and marked with dendrites (peroxide of manganese). Occurs several feet thick at this locality; also at Marsden,* three miles S.E. of South Shields.

* An analysis of the Marsden stone is given by Dr. Thomson in the "Annals of Philosophy," Vol. IV.

Carbonate of lime	62·00
——— magnesia	35·96
Insoluble matter	1·60
Loss	0·44
	100·00

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ANALYSIS.

Carbonate of lime	73·75
——— magnesia	19·53
Sand, clay, oxide of iron	2·06
Water, &c.	4·66
	100·00

No. 50. LOCALITY—BYERS' QUARRY,
COAST, FOUR MILES N. OF SUNDERLAND.

Lithological Characters.—Smoke-grey, compact, sub-crystalline, thin-bedded, surface planes irregular and thinly coated on upper side with softer yellow limestone, which generally contains numerous minute fossils (*Entomostraca* and *Foraminifera*), and broken or perfect specimens of shells (*Axini* and *Myalini*, *&c.*). Fifteen feet thick, with one or two beds of highly crystalline and concretionary limestone associated.

ANALYSIS.

Carbonate of lime	96·94
——— magnesia	1·66
Sand, clay, oxide of iron, &c.	0·60
Water, &c.	0·80
	100·00

This limestone was formerly worked and shipped to the Tyne for economical purposes (for a flux in iron works, &c.); and from its analysis, it would undoubtedly form a good tillage lime.

No. 51. LOCALITY—ROKER CLIFFS,
SUNDERLAND.

Lithological Characters.—Light yellow, soft, oolitic and vesicular, thin-bedded; unfossiliferous. From the uppermost beds of the Upper Limestone, which are nearly one hundred feet thick at this locality.

ANALYSIS.

Carbonate of lime	59·81
——— magnesia	26·06
Sand, clay, oxide of iron, &c.	0·53
Water, &c.	13·60
	100·00

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From the preceding analyses it is evident that the Magnesian Limestone differs greatly in chemical composition, so far as relates to the proportions of the two carbonates, in its various beds. Putting aside the specimens from the Lower Red Sandstone and Marl-slate (Nos. 1–15A), and taking those only of the Magnesian Limestone proper, we find that they range from a limestone containing 96·94 carbonate of lime and 1·66 carbonate of magnesia (No. 50), to one containing 42·48 carbonate of lime and 49·86 carbonate of magnesia (No. 35).

There does not seem much doubt that the differences in chemical composition here indicated are largely due to the action of segregation after deposition. Such a process has evidently taken place in these remarkable concretionary limestones (botryoidal, coralloidal, &c.) of the upper part of the Series, where the hard crystalline portions which assume the forms of grapes, coral imperfect spheres, &c., are seen to be chiefly composed of carbonate of lime, while the softer portion that fills the interstices of the concretions have a large per centage of carbonate of magnesia (Nos. 38 and 39, 46 and 47). Nor is it unlikely that the repeated alternations of crystalline and earthy strata and laminæ, often seen in sections of the Upper Limestone (Fulwell, and coast section S. of Marsden), are due to the same cause, and not to differences in the sediment deposited.

As a rule, it is the friable limestones that contain the greatest proportion of carbonate of magnesia, and the compact and crystalline limestones that contain the largest excess of carbonate of lime, as will be seen from Table III.

Hue is a less constant indicator than texture of chemical composition—though generally the light yellow beds are the most highly magnesian, and those of a darker colour (brown and grey) the most highly calcareous.

The two carbonates usually form from ninety to ninety-nine per cent. of the limestone.

Iron, either as an oxide or carbonate, is only present in small quantities.

Silica and alumina also never attain a large per centage except in the case of the shaly partings in the Lower Limestone (No. 22.)

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TABLE III, SHOWING THE PROPORTION OF CARBONATE OF LIME AND CARBONATE OF MAGNESIA IN LIMESTONES OF DIFFERENT TEXTURES.

No. of Analysis.	Colour.	Compact and crystalline.	Compact (softer.)	Friable.
16	Grey	.....	Carb. lime 56·40 —— mag. 38·88	
17	Smoke grey ..	Carb. lime 94·88 —— mag. 2·48		
18	Light yellow ..	.....	Carb. lime 66·80 —— mag. 28·88	
19	Grey	.....	Carb. lime 64·96 —— mag. 25·12	
20*	Yellow	.....	.....	Carb. lime 39·60 —— mag. 28·24
23	Yellow	.....	Carb. lime 54·40 —— mag. 46·45	
24†	Yellowish	.....	Carb. lime 54·66 —— mag. 44·79	
25	Whitish yellow	.....	.....	Carb. lime 50·96 —— mag. 44·72
26	Yellow & grey	Carb. lime 91·86 —— mag. 3·21		
27	Light yellow ..	.....	.....	Carb. lime 68·60 —— mag. 32·00
28	Yellowish grey	Carb. lime 69·84 —— mag. 20·88		
29	Yellow	.....	Carb. lime 40·40 —— mag. 49·22	
30	Yellow & grey	Carb. lime 81·52 —— mag. 7·68		
31	Brown & grey	Carb. lime 74·64 —— mag. 16·16		
33	Brown & grey	Carb. lime 91·04 —— mag. 2·24		
34‡	Greyish yellow	Carb. lime 60·72 —— mag. 35·48		
35	Yellowish white	.....	.....	Carb. lime 42·48 —— mag. 49·86
36	Grey & Yellow	Carb. lime 95·29 —— mag. 2.91		
37	Grey	Carb. lime 91·95 —— mag. 2·06		
38	Light Yellow ..	.....	.....	Carb. lime 62·94 —— mag. 33·73
39	Grey	Carb. lime 89·10 —— mag. 8·74		
40	Light yellow ..	.....	.....	Carb. lime 54·89 —— mag. 39·85
41	Greyish yellow	Carb. lime 80·01 —— mag. 9·93		
42	Light yellow ..	.....	.....	Carb. lime 52·10 —— mag. 44·04
43	Light yellow ..	.....	.....	Carb. lime 55·48 —— mag. 40·92
44	Grey	Carb. lime 94 89 —— mag. 1·71		
45	Light grey...	Carb. lime 96·55 —— mag. 1·46		
46	Grey	Carb. lime 95·58 —— mag. 2·36		
47	Yellow	.....	.....	Carb. lime 56·53 —— mag. 38·54
48	Whitish yellow	.....	.....	Carb. lime 52 66 —— mag. 45·35
49	White.....	.....	Carb. lime 73·75 —— mag. 19·53	
50	Smoke grey ..	Carb. lime 96·94 —— mag. 1·66		
51	Light yellow..	.....	Carb. lime 59·81 —— mag. 26 06	

* Contains 24·06 of sand, clay, &c. † This specimen is both compact and friable.

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TABLE IV,

SHOWING THE RELATION OF EARTHY CARBONATES.

In 100 parts.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Carbonate of lime	93·0	100.0	72·0	84·8	65·1	59·2	56·9	57·4	61·6	72·4	66·1	65·4	58·7	55·0	57·2	59·1	97·4
——— magnesia	7·0	....	28·0	15·2	34·9	40·8	43·1	42·6	38·4	27·6	33·9	34·6	41·3	45·0	42·8	40·9	2·6
Atomic proportion.																	
Carbonate of lime	1·00	....	1·00	1·00	1·00	1·00	1·00	1·00	1·00	1·00	1·00	1·00	1·00	1·00	1·00	1·00	1·00
——— magnesia	·09	....	·47	·21	·73	·81	·90	·90	·73	·45	·60	·73	·83	·97	·88	·81	·03
In 100 parts.	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34
Carbonate of lime.....	69·8	72·00	58·4	64·5	61·7	53·9	54·9	53·2	96·6	68·1	76·9	45·1	91·3	82·2	85·7	97·5	63·1
——— magnesia	30·2	28·00	41·6	35·5	38·3	46·1	45·1	46·8	3·4	31·9	23·1	54·9	8·7	17·8	14·3	2·5	36·9
Atomic proportion.																	
Carbonate of lime.....	1·00	1·00	1·00	1·00	1·00	1 00	1 00	1·00	1·00	1·00	1·00	1·00	1.00	1·00	1·00	1·00	1·00
——— magnesia	·51	·45	·84	·65	·87	1·01	·98	1 08	·04	·55	·36	1·44	·10	·25	·19	·02	·69
In 100 parts.	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51
Carbonate of lime	46·0	97·0	97·8	65·1	91·2	57·9	88·9	54·1	57·5	98·2	99·4	97·5	59·1	53·7	79·0	98·3	69·6
——— magnesia	54·0	3·0	2·2	34·9	8·8	42·1	11·1	45·9	42·5	1·8	·6	2·5	40·9	46·3	21·0	1·7	30·4
Atomic proportion.																	
Carbonate of lime.....	1·00	1·00	1·00	1·00	1·00	1·00	1·00	1·00	1·00	1·00	1·00	1·00	1·00	1·00	1·00	1·00	1·00
——— magnesia	1·39	·03	·02	·63	·10	·86	·14	1·00	·86	·02	·007	·03	·82	1·02	·31	·02	·52

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XXIV.—*Miscellaneous Notices and Observations.*

Note on Fungi from Newton Cap Colliery.—None of our members have, I believe, paid any attention to the Fungi, and it is much to be desired that some one not afraid of honest work, and at a loss for a subject on which to exercise himself, would take up this unwrought field of research. The subject, except perhaps amongst the microscopic forms, would not be beset with any very serious difficulties. The recent publications of the Rev. M. J. Berkeley, the first living authority on this branch of botany, have much smoothed the way for students of the English species. His "Outlines of British Fungology," together with the series of papers now appearing in the "Intellectual Observer," constitutes an excellent guide. The only published memoranda on the Fungi of Northumberland and Durham are, so far as I know, those contained in Winch's Flora, which, of course, are very imperfect, and not at all consonant with the present state of science. Indeed many microscopic forms are there included amongst the Algæ. The life-history of the terrestrial Algæ and their relations to the young forms of Lichens and Fungi is a subject full of interest, and having in it work for a lifetime: a most painstaking and able commencement of this enquiry has already been made by Dr. J. B. Hicks. Both for this, and for the study of the Fungi in particular, our damp northern climate offers many advantages, while the varied physical features of our two counties (comprising as they do great variety of soil and elevation—wooded, sheltered glens, alternating with exposed moorland and arid crag) would doubtless afford a large variety of species to the diligent hunter. During the excursion of the Club, last autumn, to Knarsdale and Barhaugh Burn, I noticed a great number of species, some of them of enormous size and wonderful beauty of colour. Some of these I collected with a view of determining the species, but having my hands full of other work, I never accomplished this purpose.

For the specimens now exhibited (February, 1866) I am indebted to Mr. Kirkby, who some few weeks ago kindly sent me a similar sample, which I forwarded to Mr. Berkeley, with a

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request that he would be good enough to name them. These Fungi were all obtained from the colliery workings of Newton Cap Pit, mostly from the pit-props, but in part from the surface of the coal itself. The species, as determined by Mr. Berkeley, are as follows:—*Agaricus fasciculariis*, *Corticium lacteum*, *Ozonium auricomum*, *Polyporus annosus*, *Merulius lacrymans*, *Polyporus trebeus*.—*George S. Brady, Sunderland, February*, 1866.

Flock of Starlings on the Sea-coast, near Hartley.—On the 28th of June last, I noticed a great number of the common Starling (*Sturnus vulgaris*) at the north end of Whitley sands. They were in a flock of several hundreds, and appeared to have been dwelling there for some time, as everything upon which they could perch was whitened by their droppings. The object of attraction was, I think, a large bed of decaying Algæ, which swarmed with myriads of flies and their larvæ. I have often seen large flocks of Starlings inland, but this is the first time that I have noticed them on the coast. A fortnight later I found them still there, but in very diminished numbers.—*Thomas John Bold, Long Benton, July 10th*, 1865.

Zoological Notes.—A friend informed me in August, that he had found two caterpillars of the death's head moth (*Sphinx atropos*) at the adjacent village of Billingham; and I myself found at Norton a chrysalis of the same moth, which had unfortunately been injured. It was of a dark red colour, and 2⅝ inches in length. All these specimens were noticed among potatoes, the flowers of which the caterpillars eat. I may state, that although I have observed several caterpillars of this insect, I have never but once, many years ago, seen the perfect moth, and that was taken by my father on a jasmine shrub in our garden here.

On September 26th, I shot a Great Cinereous Shrike (*Lanius excubitor*), whilst perched upon a high willow tree. Being a very good specimen I have had it well preserved. This species is rarely observed in this district.

On October 5th a fine Hake (*Merluccius vulgaris*) was taken among the rocks at Whitburn. Its shape is handsome, especially

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the head, which resembles that of the salmon. Its flavour was but poor; the flesh white, and somewhat soft. Mr. Meynell, in his account of the "Fishes of Yorkshire," p. 63, Trans. Brit. Asso., 1844, says that it is "a rare species." Sir C. Sharp has not included it amongst his "Fishes caught on the Coast of Hartlepool," in his history of that place, published in the year 1816.—*John Hogg, Norton, October*, 1865.

Aurora Borealis.—On Thursday, October 19th, 1865, at Whitburn, about half-past six o'clock, a very beautiful and rather uncommon appearance of the aurora borealis was visible to those who were fortunate enough to be out of doors. An arch of very brilliant light was stretched across the zenith from east to west, apparently about 5° in the broadest part, diminishing towards the east to about 3°. The brightest stars were visible through the edges of the arch; but the light in the middle and a little to the west of the zenith was too brilliant to allow any star to be seen. The wind was northerly and rather brisk. The common aurora borealis was showing itself in the north, but without any visible motion. The arch commenced in Aries, passing through Pegasus and Cygnus. The bright star Vega, in the constellation Lyra, was shining through its northern border. The arch gradually declined, through the constellations Hercules and Bootes, towards the west, where about five o'clock the sun had set in a bank of clouds too dense to allow the annular eclipse of the 19th October to be seen in this neighbourhood. In a few minutes the arch gradually bent towards the south, as if the wind was moving it onward, and slowly died away. Such a brilliant sight has not been visible here for many years.—*Cuthbert Hutchinson, Monkwearmouth.*

Naturalists' Field Clubs.—I am requested by the Secretary of the Manchester Field Naturalists' Society, Mr. L. H. Grindon, to correct a statement made in a paper of mine (see p. 109 of the present volume) that scarce plants had occasionally been exterminated, owing to the plan of proceedings adopted by that Society. Mr. Grindon, who is doubtless well informed as to the facts of the case, informs me that this is an error, and that the

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Fauna and Flora of the neighbourhood, so far from being impoverished, have in fact been enriched, and that while "no rare plant has suffered through the Society, many new localities and several new species have been added to the lists." The Society is, moreover, endeavouring to improve the natural Fauna and Flora by encouraging its members to take on the excursions "any surplus roots and seeds they may possess, especially of native plants brought from a distance, and also living freshwater mollusca, and depositing them in places where they would be likely to become permanently established. No confusion," the Society thinks, "would thus be caused, since the Fauna and Flora of the neighbourhood are now both well known, and the introduction of new species would be a set-off also against any possible lessening of the abundance of those produced spontaneously. Members are invited to collect seeds, &c., for this especial purpose when at a distance from home, and also to enrich the neighbourhood by a judicious sowing of the seeds of exotic plants."

I quote these extracts from the regulations of the Manchester Society at the special request of the Secretary, but I must at the same time distinctly disclaim, for my own part, any wish to recommend a similar course of action (as to the introduction of new species) to the members of the Tyneside Club. The botany and zoology of our neighbourhood are certainly *not* known with sufficient accuracy to warrant the artificial introduction of new species.—*George S. Brady, Sunderland, June*, 1866.

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ADDRESS TO THE MEMBERS OF THE TYNESIDE NATURALISTS' FIELD CLUB,

READ BY THE PRESIDENT, THE REV. ALFRED MERLE NORMAN, M.A., AT THE TWENTIETH ANNIVERSARY MEETING, HELD IN THE MUSEUM OF THE NATURAL HISTORY SOCIETY, NEWCASTLE-UPON-TYNE, ON THURSDAY, APRIL 19TH, 1866.

GENTLEMEN,—In rising to address you I desire, with my opening words, humbly to thank you for the high honour which it has been your pleasure to confer upon me in elevating me to the position of your President during the past year. The office of directing a Club which is continually gaining for itself a more distinguished rank among the scientific societies of Great Britain, which can count at the present time more than six hundred members, and embraces many naturalists who have achieved for themselves not merely a European, but a world-wide reputation, is year by year becoming a more distinguished honour. I felt it to be an honour of which I was myself wholly unworthy. A comparative stranger to most of you, who had not been resident in the North for any lengthened period; younger in years than any President you had previously elected, and holding no distinguished social position among you, I believed that there were others who would more worthily fill the office than myself, both on these accounts, and also by reason of their higher scientific attainments. Added to all this, though devotedly attached to Natural History, its pursuit was not—must never be—the business, but merely the relaxation and pleasure of my life; and duties higher even than those which I should owe towards you, gentlemen, must, I knew of necessity, interfere with the proper discharge of what would be incumbent upon me as your President. Upon all these grounds I believed it, on a previous occasion, to be right to decline the distinction which your Committee desired to have conferred upon me. But when last April you a second time expressed your kind desire that I should undertake the office, it was obvious that refusal again on my part would have been both uncourteous and ungrateful. I could therefore only reply, that if it were your wish I would do my best to promote, during

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my Presidency, the interests of the Club, though I feared that my duties as a clergyman, in the midst of a large population, would not allow me to attend the Field Meetings as regularly as I should be anxious to do. I have said this much, gentlemen—perhaps too much—because I would ask your forbearance should I not have been as constantly present among you during your summer forages as some of you may have thought I ought to have been, and as it was certainly my desire to be. Without further preface I will now proceed to fulfil that rule of the Club, which directs, "that at the close of each year the President be requested to favour the Club with an address, containing a written summary of its proceedings at the several Field Meetings, together with such observations from himself as he may deem conducive to the welfare of the Club, and the promotion of its objects;" but I must not commence this record of our proceedings until I have first returned my sincere thanks to Dr. Embleton and Mr. G. S. Brady for their kindness in having furnished me with an account of those meetings in which I was myself unfortunately prevented from taking part.

The First Field Meeting of this year was held at Hartford Bridge. On the 26th of May a large party, which, with the additions subsequently made to it, was found to number no less than eighty-seven members, left the Central Station by the 1·20 train for Plessey. From thence the road was taken to Blagdon, the seat of Sir Matthew White Ridley, Bart., which is about two miles from the station. Here the members rambled through the grounds, garden, and hot-houses, and then walked to Stannington Bridge. At this point leaving the road, we followed the course of the winding Blyth to Hartford Bridge. The romantic and wooded banks of the river were covered with a profusion of spring flowers; and insects and birds seemed to be in as full enjoyment of the delightfully warm sunny spring day as were their biped brethren. Hartford Bridge was reached a little after five; and the hungry guests did ample justice to the tea which mine hosts of the "Jolly Anglers" and "Bridge" Inns had provided for them. After tea, as there was no room large enough to contain

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all the members, an open air meeting was held on the bridge, when the President delivered a short introductory address, and then the Secretary read the valuable "*Catalogue of the Recent Foraminifera of Northumberland and Durham*, by Henry B. Brady, F.L.S., F.G.S.," which has since been published in our Transactions. Among the less common plants observed during the day's walk, were *Ranunculus floribundus*, Bab., the large white blossoms of which covered a pond near the Plessey Station, and *Ranunculus auricomus*, L., which was growing on the banks of the Blyth. In a quarry pond, between Plessey and Blagdon, I met with *Daphnia magna*, Straus, (D. Schœfferi, Baird,) in great abundance. This is an entomostracan which has only as yet been observed in two other habitats in our district. Mr. Bold, who was one of our number, found the ground between Stannington Bridge and the "Jolly Anglers" very promising for insects, and he has favoured me with the following notes on the captures. The "brisk use of the sweeping net showed the herbage to be alive with Coleoptera; of which the most abundant were—*Corymbites Quercus*, *Phyllobius viridicollis*, *Erirhinus aoridulus*, *Tropiphorus mercurialis*, *Sitones sulcifrons*, *Galeruca tenella*, *Crepidodera rufipes*, and *Anthobium minutum*.

"Amongst the rarer species may be mentioned the occurrence of—*Encephalus complicans*, *Homalota brunnea*, *Eusphalerum Primulæ*, *Anthobium Sorbi*, *Agathidium ovalis*, *Telephorus pallidus*, *Barynotus mœrens*, *Sitones humeralis*, *Hypera variabilis*, *Thyamis Anchusæ*, *Psylliodes atricilla*, and *Rhizophagus cribratus*.

"Several obscurities, which I have not yet had time to work out, are amongst my captures. Of these the only beetle known to me as new to our local Fauna, is *Paramecosoma melanocephala*, Herbst., = bicolor, Curtis, British Entomology, Plate DCVI.

"The only bees noticed were *Bombus lucorum* and *muscorum*: both very sparingly. Female wasps were however plentiful.

"Several species of Hemiptera were taken, but the only ones determined are—*Liocoris bipunctatus*, *Rhyparacromus sylvestris*, and *Anthocoris nemorum*. There appeared to be a remarkable scarcity of the larger Lepidoptera; the small white [*Pontia Rapæ*], and the beautiful orange tip [*Anthocharis Cardamines*],

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being the only butterflies seen. Large moths appeared to be equally scarce; but some very good small ones were taken by Mr. John H. Tillman, of North Shields, who formed one of the party."

Mr. Barkas, who was actively engaged in collecting Diatomaceæ, informs me that he observed "very strong motions in the endochrome of various frustules of *Cymbella gastroides*," which he then obtained.

Thirteen gentlemen were elected members of the Club at this meeting.

The SECOND FIELD MEETING took place on the 29th of June. On this occasion it was resolved to extend our rambles beyond our usual western border, and to visit the interesting district of Cumberland, which includes Naworth, Lanercost, Talkin Tarn, and Tindale Fell. Thirty-two members were early risers that morning, and left Newcastle at a quarter past six. Arrived at the Naworth Station, the members separated into two sections. The first of these proceeded, under the guidance of Dr. Johnson, of Brampton, to Naworth Castle, where they were most courteously received, and conducted through the armoury, the state and the private apartments. After enjoying the beautiful scenery which surrounds the Castle, they walked through the woods and crossed the Irthing to Lanercost Priory, the remains of which were inspected with much interest. The Priory, the style of which is early English, it having been erected about 1150 A.D., was built with stones taken from the Roman Wall. From Lanercost the members walked to Talkin Tarn, a small lake surrounded by woods. After staying here some time they left for Brampton, the appointed dining place. The second section meanwhile went southwards to Tindale Fells, and followed the road past Farlam to the Mountain Limestone quarries, and thence over the fells to Tindale Tarn, on which a few swans were quietly sailing. It is a bare sheet of water, which lies at the north side of Tindale Fells, and its waters form one of the feeders of the Allen. A few of the members climbed to the top of the fell, and were rewarded by an extensive view over the fells and

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vales on the confines of Cumberland and Northumberland. In straggling groups the wayfarers returned by a more westerly road than that by which they had come to Hall Bank Gate, near Farlam, and then striking direct west, found their way to Talkin Tarn. Here some rested by the rippling waters and enjoyed the breezes; others pushed on to the Gelt to inspect the "written rock" which has been often described (see Bruce on "The Roman Wall"). The two parties met at four o'clock at Brampton, and dined at the "Howard Arms." After dinner a paper was read by Mr. Barkas, entitled, "Notes on Diatomaceæ gathered during the Hartford Bridge excursion;" and nine gentlemen were elected members of the Club. At half-past six the excursionists brought their rambles to an end by reaching the Milton Station in a high wind, and amid clouds of dust, to take the return train to Newcastle.

The THIRD FIELD MEETING was appointed for the 20th July. On this occasion the Club, represented by between twenty and thirty members from Newcastle, Shields, Sunderland, Hexham, &c., (the general election in the County of Durham keeping many at home,) alighted at about eight o'clock at the Wark Station on the North British line, and crossing the wooden bridge, entered the square of the ancient city of Wark.

Turning sharply to the left beyond the square, they mounted the Mote Hill, a natural gravelly and prominent elevation, on the summit of which, and in the fresh open air, Dr. Charlton read to the surrounding members an interesting paper on "The Sessions of the Liberty of Tynedale, held at Wark, in the Thirteenth Century," which will be published in the forthcoming part of the Transactions.

After breakfast at the Grey Bull the Club, under the guidance of Dr. Charlton, left Wark by the west road, and after a pleasant climb up the hill pastures in the deliciously warm morning sunshine, they struck Wark Burn at Ramshaw's Mill, wandered up the Burn for two or three miles enjoying the pretty scenery, and examining the outskirts of the Coal Measures as seen in occasional

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sections on the face of the scaurs, and the Mountain Limestone, which here succeeds the coal strata.

They were joined by W. H. Charlton, Esq., of Hesleyside, who pointed out many of the peculiarities of this place and district.

Rose's Bower,* about four miles up from Wark, was reached, after the sulphur well a little below had been tasted. The water of this well is no doubt possessed of considerable medicinal power, and rivals that of Gilsland.

This so-called bower, formerly the pale or fortified residence of Anthony Milburne, a border chieftain, stands on the north bank of the burn on the edge of a precipitous rock, which is cut off from the land on the west side by a deep dell, partly artificial, into which falls in a cascade a small tributary of the Wark Burn. The remains of the ancient bower have been converted into a farm house, which is now easily accessible from the north. A few old, and weather-beaten trees, on the top and sides of the rock, afford some scanty shelter from the storms of winter, and give a picturesqueness to the scene.

A little above Rose's Bower is the Linn, a remarkably wild and beautiful spot, where the mountain limestone forms an irregular but imperfect barrier to the waters of the burn. Little water, owing to the prevalent drought, was on the occasion of our visit passing over it; but during winter the stream must at times leap in a violent, tumultuous, and impressive fall on the rocks below. *Cystopteris fragilis*, *Polypodium phegopteris*, and *dryopteris* were gathered, and above the Linn, *Asplenium trichomanes*, and several of the commoner species of ferns.

About a mile above the Linn was observed one of the so-called petrifying waters trickling down the face of a deep scaur, and encrusting the mosses and grasses in its course.

Leaving the Wark Burn at this point, the party walked northwards over the moory pastures and struck the Howkesty Burn about Linacres. The devious and charming windings of this

* The name Bower (I am informed by Dr. Charlton) is probably derived from the Anglo Saxon for a dwelling place.

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stream were followed till the Bellingham road was met with, and along this the Club returned fatigued but gratified to Wark.

A very good dinner, well served, was in store for them, and was greatly enjoyed.

After dinner five members were elected, and Dr. Embleton read a short paper by the Rev. W. Greenwell and himself, on an Ancient British Burial, and on the skull of the person interred, at Ilderton, Northumberland. The Rev. G. R. Hall also read a carefully prepared paper "On the Opening and Examination of a Barrow of the British Period at Warkshaugh."

As these two contributions will be published in extenso in our Transactions, it is unnecessary that I should further refer to them here.

Soon after the reading of these papers the train received the party, who reached home full of pleasant recollections.

The FOURTH FIELD MEETING took place on the 17th of August. The weather was unsettled, but thirty members started from the Central Station at 5·15 for Leamside, and being joined there by others from Sunderland, &c., proceeded by Durham and Bishop Auckland to the charming vale of the Tees, and left the train at Barnard Castle. After a substantial breakfast, some of the party visited the ruins of the old castle, others the church: vehicles having then been obtained, a small section drove off to see the High Force; while the rest, crossing the Tees, walked on to Lartington Beck admiring the bold and commanding position of Baliol's Castle seated on its high and rocky base, and the splendid river and woodland scenery. Following the windings of the beautiful Lartington Beck for three or four miles, and visiting the remarkable and enormous granite boulder which is supposed to have travelled from Shap Fell, they passed from the western termination of the Coal Measures to the Millstone Grit, huge masses of which, lying in the bed of the Beck, here and there nearly bar its passage. They passed under the light and elegant viaduct that spans Deep Dale, carrying high in air the heavy railroad trains that, passing with speed, send scarcely any vibration to the bases of the iron columns of support. Further

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up, the valley is hemmed in by precipitous rocks and dense woods, beyond which it suddenly opens out into a bare mountain region. Quitting then the valley, after the cascade had been viewed, the members struck out northwards and visited the old fish-ponds of Lartington, and through pleasant fields, and with a splendid country wide-spread before them, they wound their way to Lartington Hall, the seat of the Rev. Thos. Witham. By this gentleman they were most kindly and hospitably received, and had the gratification of seeing many masterpieces of art in his elegant mansion. The famed Museum of geology and mineralogy, the paintings by ancient and modern masters, the new gallery of entrance full of rare and beautiful objects, and enriched by the many admirable sculptures in wood by Signor Bulletti, of Newcastle, the complete and scientific new suits of offices in the rear of the house, the spacious and beautiful grounds and gardens, all received that earnest attention which, though necessarily brief, they justly claimed. The party were with the greatest urbanity escorted through this gem of a highly-educated country gentleman's seat by Mr. Witham himself, and nothing was wanting to the completion of the enjoyment of the whole of the visitors, so that they bore with cheerful complacency the rather heavy rain that accompanied their return to Barnard Castle along the wooded banks of Tees, where another airy viaduct carries the iron road across the valley. The visitors to the Force having returned, the castle, with its precincts, and the church received another visitation, and then an excellent dinner at the "King's Head," flavoured with the best sauce in the world, closed the day's enjoyment.

The members returned by the last train to their respective homes, discussing with delight the geology and botany of the Tees, and the past and present glories and beauties of Barnard Castle and Lartington.

Five gentlemen were added to the Club this day.

The FIFTH FIELD MEETING was fixed for the 8th of September. The members who left Newcastle by the 6·15 train were joined at Haltwhistle by others who had proceeded thither the previous

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evening. From thence they went on by train to Slaggyford. There, on leaving the station, they walked a short distance up the South Tyne, then crossing the stream by a footbridge, struck the Barhaugh Burn, the course of which stream was followed for a mile or two. The excursionists then found themselves on Williamstone Fell, from the summit of which the views looking back over the valley of the South Tyne to the Cumberland Hills are very fine. Williamstone Fell was traversed in a north-easterly direction until the Lough at the head of Snowhope Burn was reached. This bleak little tarn, according to the calculation of one of the party, who carried an aneroid barometer, is seventeen hundred and fifty feet above the sea. It contains no vegetation, but is filled with boulders of millstone grit, which at this point makes its appearance above the limestone. Some of the members then went on a little further to examine the "Old Lough," a still smaller piece of water, which lies a few hundred yards to the east of the other tarn. It was found to be much overgrown with reeds and grass, and to be surrounded by a very swampy margin. There were indications that this piece of water had once occupied a much larger area, and that it had been diminished in size by drainage. Mr. G. S. Brady found in it *Daphnia mucronata*, Müller, which was abundant, and also *Acantholeberis curvirostris*, Müller, *Alona elongata*, G. O. Sars, and *Chydorus sphæricus*, Müller. In the larger lough there were living *Cypris ovum*, Jurine, *Bosmina longirostris*, Müller, and *Alona elongata*. The last named species has not as yet been recorded as a member of the British Fauna, though Mr. Brady and myself find it to be not uncommon in the lakes and mountain tarns of the North of England. It has probably hitherto been confounded with *Alona quadrangularis*. The walk down Snowhope Burn was rough and picturesque, and the bed of the stream was followed for a considerable part of the distance. During the excursion the ordinary fossils of the limestone were observed in great abundance: the plants gathered were chiefly ferns, and of these there was a fair variety—e. g., *Lastræa filix-mas*, *L. oreopteris*, *Athyrium filixfœmina*, *Cystopteris fragilis*, *Asplenium trichomanes*, *Polypodium vulgare*, *dryopteris* and *phegopteris*, *Blechnum boreale*, and

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Polystichum aculeatum. The Fungi noticed during the day were remarkably fine and numerous. It is much to be regretted that none of our members devote themselves to the study of this section of Cryptogamic Botany. The wild roses, which were beautifully in fruit, would also have well repaid the attention of a botanist intimately acquainted with these most difficult and puzzling plants. Having descended into the valley, the South Tyne was crossed by the bridge near the foot of Snowhope Burn, and Burnstones Inn was reached, where an excellent dinner awaited the naturalists.

Three new members were afterwards elected; and the 5·40 train, by Mr. Smiles' kind permission, having stopped at Burnstones, the members at that time commenced their homeward journey.

The SIXTH AND LAST FIELD MEETING took place in accordance with the custom of many years, at Marsden; and as has previously been the case it proved (from its proximity to the large towns, and the shortness of the walk, which enables ladies to take part in it,) the most attractive rendezvous in the programme of the year. Indeed, we believe that at no previous meeting of the Club has there been so large an attendance. No less than one hundred and thirteen members and their friends sat down to tea in Mrs. Allen's cavern reception room. As soon as the tables were cleared the business of the afternoon commenced with the election of seventeen new members. This was followed by the reading of a paper

"On Bacillaria cursoria, its Habitats and peculiar Motions," by Mr. T. P. Barkas.

Mr. Thomas Thompson then exhibited a specimen of *Nephrops Norvegicus*, a species of lobster, which, until within the last few years, was unknown on this part of the coast. It is now however brought to the Newcastle market in considerable numbers, being taken in the trawl nets, the use of which has only recently been introduced by the fishermen.

Some discussion then took place respecting a cave recently discovered at Ryhope, in which human and other bones had been

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found in considerable quantity. Ultimately a committee, consisting of Dr. Embleton, Rev. W. Greenwell, and Messrs. J. W. Kirkby, G. S. Brady, and E. C. Robson, was appointed, with a request that they would investigate the nature of the discoveries already made, further explore the cave, and present a report upon the subject to the Club.

It was a beautiful autumnal evening as the members separated and dispersed in all directions—some on foot, some in carriages, some by train—to their respective homes.

Thus ended our rambles of the year; but we have not been idle during the winter season. Three joint Evening Meetings of the NATURAL HISTORY SOCIETY OF NORTHUMBERLAND, DURHAM, AND NEWCASTLE-UPON-TYNE, and the TYNESIDE NATURALISTS' FIELD CLUB have been held, each of which was numerously attended. Indeed, there is reason to think, that the room at present used for these meetings will ere long be found to be wholly inadequate to the purpose.

The FIRST EVENING MEETING took place in the Curator's Room of the Natural History Society, on Thursday, the 2nd of November, when the following papers were read:—

1. "*On the Organization and Alternate Generation of Salpa spinosa* (Otto) *as observed in the Channel Islands*, by the Rev. A. M. Norman, M.A."

I had the pleasure of discovering this highly interesting animal in the British seas for the first time in August last. It was taken in the towing net off Fermain Bay, Guernsey; and the aggregated chains, the disconnected sexual individuals, and the dissimilar asexual animals were all procured in considerable numbers. The account given to the Club contained observations on the anatomy and physiology of both sexual and asexual forms, partly confirmatory of the accounts given by previous writers (especially Huxley, Sars, and Krohn), and partly supplementary to, and corrective of, their descriptions. I had the good fortune to see the asexual individuals within the body of the aggregated chain animals, and also to witness the reproduction from the former of the Salpa-chains. In one case I was able to watch the successive

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development of three series of chains from the same asexual and gemmiparous mother. Each of these chains (not always produced entire, but more generally separated by the act of extrusion into two or more parts) contained between sixty and seventy animals, arranged in double row, those in the one side being vis-a-vis to those on the other, so that the posterior opening in all the animals is directed outwards. The rapidity of growth in the Salpa-chain while in the act of extrusion from the mother, and during the first twenty-four hours afterwards, is astonishing. The asexual individuals have a threefold mode of progression: first, a regular gliding motion; secondly, an irregular jerking motion; and thirdly, they would sometimes turn somersaults, revolving as it were upon a transverse axis.

Mr. G. S. Brady then read a "*Note on the Occurrence of Bostrychia scorpioides on the Northumberland Coast.*" This alga, which had not previously occurred in the district, was found by Mr. Brady in brackish water pools at Alnmouth, where it was growing freely, without any basis of attachment.

This was followed by "*Entomological Notes*, by Mr. Thomas J. Bold;" after which Mr. Barkas called attention to the recent sudden appearance in the neighbourhood of Newcastle of an aeronautic spider, in countless myriads, and its equally sudden disappearance. The spider in question is a species described in the "Annals of Natural History" for 1863, under the name of *Neriene dentipalpis:* up to that time it had only been seen in small numbers in Wales. On Sunday, the 15th October, 1865, they were exceedingly abundant in all parts of Newcastle, and on the same day they were observed at Hexham. The previous day they were noticed at Bedlington. On the Sunday (October 15th) myriads of them were seen around Bilston, in Staffordshire, and similar numbers on the same day at Blackburn. On the 12th of November swarms of them were covering the rails around Victoria Park, London. These spiders disappeared from the neighbourhood of Newcastle as suddenly as they came, and not one was to be found on the following day.

Six members were added to the Club.

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The SECOND EVENING MEETING was held on the 8th of February. The following papers were read:—

1. "*On Siliceous Casts of Corals from the Refuse of Chemical Works on the Tyne*, by Mr. H. B. Brady, F.L.S."

2. "*Remarks on the Report of the Commissioners appointed to enquire into the State of the Sea Fisheries*, by the Rev. R. F. Wheeler."

3. "*On Diatomaceæ discovered between Tynemouth and Hartley*, by Mr. T. P. Barkas."

After the reading of this paper Messrs. Mawson and Swan exhibited, by means of the Oxyhydrogen Lantern, some microphotographs of Diatomaceæ, and other objects, which had been photographed by Dr. Maddox, of London. The microphotographs were wonderfully beautiful, exhibiting the various objects in such a perfect manner, that the finest sculpture of the Diatoms was seen enormously magnified by means of the lantern.

4. "*Natural History Notes*," by Mr. John Hogg, F.R.S."

Eight new members were elected.

The THIRD EVENING MEETING was held on Thursday, March 22nd. The room was well filled with members, and the following papers were read:—

1. "*On a recently opened Bone Cave at Ryhope*, by Messrs. J. W. Kirkby and G. S. Brady." This paper will be published in the Transactions. The discussion which ensued drew forth from the Rev. W. Greenwell an extremely interesting account of a cave which had been discovered at Heathery Burn, near Stanhope. Mr. Greenwell promised to lay before the Society on a future occasion an extended account of this cave; but meanwhile he gave a few particulars respecting the result of his investigations up to the present time. It would appear that this cave had been the habitation of a family consisting of seven persons. The bones had been sent to London and had been partially examined by Professor Huxley, who considered them to belong to the ordinary type of people who inhabited our country before the Roman occupation: unfortunately, the human remains had subsequently disappeared in a most remarkable manner. Besides the skeletons

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of this family the cave contained an enormous quantity of animals' bones, which in all cases had been broken, apparently with the object of extracting the marrow. It was stated that cart-loads of such bones had been taken away before Mr. Greenwell visited the spot. The cave is of considerable size. Its entrance was near a small stream; and the most probable conjecture appeared to be that during the night, while the tenants were asleep, a heavy thunderstorm had suddenly swollen the burn, that the trunks of two or three trees brought down by the flood had acted as a temporary barrier to the escape of the inhabitants, who were thus drowned within the cave. Had they been killed by enemies the valuable relics, which had been found, would not have been left. Mr. Greenwell had met with the whole belongings of the family. There were traces of fires having been lighted in different parts of the cave, and a large quantity of unornamented and imperfectly baked pottery and other articles had been found. All the pottery was broken. There had also been found several arms and implements of warfare including two bronze swords, one of which was broken, the other he had not seen. Eight spear heads were found of various sizes, and of the most beautiful make. He defied any one in the present day to manufacture more beautiful spear-heads, either as regarded the structure or the ornamentation. Eighteen celts, or as some people called them, hatchets, were also found, and together with these a very interesting mould, evidently used for casting celts in. Yet curiously enough, although all the celts found differed in size and shape, none of them agreed with that of the mould. There were also a great number of bronze pins very beautifully made, and eight circular discs, each with a small loop at the top, as though for the purpose of attaching them to some woollen or cotton fabric. Besides these there were eight very wide armlets, and three or four others of ordinary size. Then there were a considerable number of bone implements—pins, buttons, &c.: he had come to the conclusion that some of these implements had been used in weaving. A necklace of very humble description, consisting of three shells, which had been suspended on a string, was also among the spoils. All these articles were found upon a sort of

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floor varying from two to three inches in thickness, underlying the stalagmite, with which the bottom of the cave was encrusted; and this circumstance induced him to think that the various things found all belonged to one period. Besides the articles already enumerated, there had been found two very beautiful gold pieces, which he brought with him for the inspection of the Club. One of these was apparently an armlet of a type which was not unfrequently found. The other was a sort of hollow ring—a kind of capsule. It was a very curious object, and it was difficult to assign the use to which it had been put: possibly it might have been used as money. Mr. Greenwell only knew of four or five similar capsules that had been found: one in Anglesea, one in Scotland, two or three in Ireland, and another near Alnwick, where it was discovered in making a railway cutting. Could all the articles found in the Heathery Burn cave have been gathered together, they would have formed one of the most valuable collections in the country, and would have given at a glance some idea of the habits of the people who inhabited Great Britain at a period previous to the Roman invasion.

Mr. Greenwell's highly interesting account of these remains was followed by a paper, from Mr. Mark Bullen, "*On a Method of injecting Anatomical Preparations for the Microscope.*" Mr. Bullen illustrated his paper by the exhibition of some very beautiful injections, which had been made by means of the apparatus which he had devised.

The last paper read at this Meeting was "*On the Present State of our Knowledge of Eozoön canadense*, by Mr. H. B. Brady, F.L.S." who advocated the views of Sir W. Logan and Dr. Carpenter as to the structure of this rock, ascribing its appearance to the fossilization of organic remains belonging to an animal which he would refer to the Foraminifera; while he combated the opinion of those who maintain its inorganic origin and structure.

Two gentlemen were elected members, and thus we brought to a conclusion our sessions for the winter season.

Exactly twenty years have passed since a few gentlemen met in a room not far from that in which we are now assembled, and

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set on foot the TYNESIDE NATURALISTS' FIELD CLUB; and when presenting to you the usual address of the retiring President I have thought, that in selecting a subject to which more especially to direct my remarks, I could not do better than on the twentieth anniversary of this Society to endeavour to lay before you a brief account of its origin and progress, from its first establishment to the present time. Such a review of the past will, I doubt not, prove interesting; and in looking back and seeing the advances which have been already made, we shall find incentives to fresh exertions to extend the operations and increase the usefulness of the Society.

The credit of originating the TYNESIDE NATURALISTS' FIELD CLUB is, I believe, due to Mr. Ralph Carr (then of Dunston Hill, now of Hedgeley). Mr. Carr believed rightly that a Club, similar in character to that which had been a short time before established in Berwickshire, might be successfully set on foot in Newcastle. This gentleman, therefore, having first consulted with the Rev. John F. Bigge and the Rev. R. C. Coxe (then Vicar of Newcastle, subsequently Archdeacon of Lindisfarne), made the proposal to establish the Club to a few of the Newcastle Naturalists. The result was that a committee was formed, consisting of Mr. Alder, Mr. Loftus, Mr. Fryer, and the gentlemen already named, for the purpose of drawing up rules. That done, the first meeting of the Club was held in the rooms of the Natural History Society of Northumberland, Durham, and Newcastle-upon-Tyne, on the 25th of April, 1846. At this meeting the Club was established, the rules agreed to, and the following officers for the ensuing year were elected—Mr. Carr, President; the Rev. John F. Bigge, Vice-President; Mr. John Thornhill, Secretary; and Messrs. Fryer, Alder, and Loftus, Committee. A second general meeting of the Club was called on the 11th of May, in order to pass rules relating to the publication of lists of the natural productions of the two counties, and to elect committees to whom the preparation of the several lists should be entrusted. The Club was now fairly launched and afloat, and the volumes of Transactions published from that time to this tell us how it has flourished. I have drawn up a table which I lay before you,

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YEAR.	PRESIDENT.	MEMBERS ELECTED.	TOTAL MEMBERS.	RECEIPTS.	EXPENDITURE.	TRANSACTIONS. PAGES.	TRANSACTIONS. PLATES.	
				£ s. d.	£ s. d.			
1846	Ralph Carr, Esq.	87	87	11 15 0	7 10 6	209	..	Transactions of the Tyneside Naturalists' Field Club. Vol. I.
1847	Rev. John F. Bigge, M.A.	13	100	Accs. imperfectly kept.		55	..	
1848	Rev. R. C. Coxe, M.A.....	12	100			47	2	
1849	Joshua Alder, Esq.	13	113	76 16 5	76 15 11	126	6	
1850	Dennis Embleton, Esq., M.D.....	38	150			132	3	
1851	Robert Ingham, Esq., M.P.....	61	206	58 12 11	55 11 3	155	..	Vol. II.
1852	Archdeacon Thorpe, D.D.	36	242	61 2 6	61 2 1	37	2	
1853	Sir W. C. Trevelyan, Bart.	23	230	60 9 6	64 14 1	27	..	
1854	Thomas Sopwith, Esq., F.R.S. ..	20	250	43 17 0	17 18 0	47	1	Vol. III.
1855	Rowland Burdon, Esq.....	25	275	16 6 6	13 5 9	115	9	
1856	John Hogg, Esq., M.A., F.R.S. ..	11	201	Accs. imperfectly kept.		138	2	
1857	William Kell, Esq., F.S.A.	20	221	113 9 8*	81 2 11	72	7	Vol. IV.
1858	William Kell, Esq., F.S.A.	56	277	74 16 0	100 6 5	118	7	
1859	Rev. H. B. Tristram, M.A., &c...	65	349	73 9 6	57 9 3	163	6	
1860	George Wailes, Esq., M. Ent. Soc.	73	376	92 14 6	92 12 7	155	7	Vol. V.
1861	Frederick H. Johnson, Esq., M.D.	100	451	108 15 7	122 14 7	186	10	
1862	Rev. W. Greenwell, M.A.	60	480	111 12 6	76 6 4	90	1	Vol. VI.
1863	Edward Charlton, Esq., M.D.....	40	500	121 2 0	128 16 5	200	5	
1864	Rev. G. C. Abbes, M.A.	58	523	141 9 9	161 8 10	142	12	Nat. Hist. Trans. of Northd. and Durham. Vol. I.
1865	Rev. A. M. Norman, M.A.	81	573	210 6 0	195 10 0	..	..	

* This sum includes many subscriptions which ought to have been paid in preceding years.

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and which is intended to show the exact position and work of the Club in each year since its foundation. The statistics contained in this table have been gleaned partly from the published Transactions, and partly from the Secretaries' and Treasurer's books.

Real and substantial as was the success which attended the foundation of the Club, and which continued to mark the growth of its early years, it is not a little satisfactory to observe that the ratio of progress, so far from falling off, has been steadily increasing for many years past.

The number of members during the first year after the establishment of the Club was eighty-seven; in 1856 this number had increased to two hundred and one; last year it had risen to five hundred and twenty-three; at the present time it amounts to no less than five hundred and seventy-three. During the past twelve months eighty-one new members have been elected, an addition to our ranks which has only been exceeded in one previous year.

Now let us look at the income and outlay. In 1846 £11 15s. was received and £7 10s. 6d. was expended. These amounts have been gradually increasing, especially during later years, until last year our receipts had swollen to £141 9s. 9d., and our expenditure to £161 8s. 10d. At this Anniversary a statement has been laid before you which shows that the sums just mentioned have been again exceeded, and our Treasurer has announced to us the agreeable facts that in the accounts now audited the sum of £210 6s. stands on the creditor side, and £195 10s. on the debtor. What is still more important, we have only one outstanding bill of £9, and commence the opening year with a balance of £28 8s. 6d. at our bankers. We have every reason therefore to be well satisfied with the present financial condition of the Club.

I feel that I should be ill discharging my duty, gentlemen, and at the same time be depriving myself of a pleasure, did I pass from the present subject without expressing the high opinion I entertain of the value of the kind offices of those gentlemen who so ably conduct the business of the Club. From myself, personally, I trust that they will accept my grateful thanks for

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that most unvarying courtesy and attention that I have at all times, and especially during my year of Presidency, received at the hands of each and all of them. The position which the FIELD CLUB has now attained must be attributed chiefly to the active and continued exertions of the Committee, and especially of the Treasurer and Secretaries. But while all these are deserving of our warmest thanks, I cannot forbear singling out the name of one gentleman, because I believe that his services to us are little appreciated by the members generally. Indeed, it is only since I commenced the preparation of my address, that, having had occasion to examine carefully the accounts of the Club, as kept from the commencement to the present period, I have myself become aware how from time to time the degree of its prosperity has fluctuated, and been apparently dependant upon the activity and efficiency of the Treasurer. In 1857 Mr. Green kindly undertook that office, and from that year dates a marked improvement in our financial position, an improvement which, during the nine years which have since elapsed, has been continuously progressive. Mr. Green's work has not been the less valuable to us because it has been work done in his study. He has been content to do us a great amount of good unknown to ourselves. Once a year he has stood up at the Anniversary Meetings and read a short summary of those accounts which he has kept, and sat down again; and that is all that we have seen or heard of his labours. But after the careful investigation which I have made into the accounts of the Club, and the strong impression which that scrutiny has left upon my mind, I feel that I should be greatly wanting in what was due to you and to him did I not seize this opportunity of testifying to the value of the services which Mr. Green has rendered us, and of signifying my sense of the debt of gratitude which we owe him.

The same satisfactory progress, which we have seen to be marked by the increase in the number of our members, and the funds at the disposal of the Club, is evidenced also in the publication of our Transactions. There have now been circulated six volumes and the first part of a seventh, containing in all 2304 pages of letter-press, illustrated with eighty plates. Each of the

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first two volumes recorded the proceedings of the Club during four years. Each of the Vols. III and IV contained the writings of the members during three years; but at the present time it is found necessary to issue an entire volume every other year. The first six volumes were published under the title, "*Transactions of the Tyneside Naturalists' Field Club.*" At the conclusion, however, of the sixth volume, there will be found the "*Terms of an Agreement between the Natural History Society of Northumberland, Durham, and Newcastle-upon-Tyne, and the Tyneside Naturalists' Field Club.*" By one of the terms of this agreement (an agreement advantageous to the interests of both Societies) it is resolved, that in future the Transactions of the two Societies shall be published jointly, under the title of "*Natural History Transactions of Northumberland and Durham.*" It is under this name, therefore, that the first part of what would otherwise have been the seventh volume of the Transactions of the Tyneside Naturalists' Field Club has now appeared.

The volumes published by our Club hold at the present moment a very high position in the literature of British Natural History. It is no presumption, I think, to speak of them as the most valuable Natural History Transactions published by any provincial scientific body in England. They are now much sought after, not only in our own country, but also on the Continent; and I have myself received, during the past year, many gratifying proofs of the esteem in which the Transactions are held by our fellow-labourers across the water, and especially by the naturalists of Scandinavia and Germany. The time has come when it seems to be almost imperative that the volumes which record our proceedings should be brought out by a London publisher, or at any rate, that a London agent should be appointed for their sale. Negotiations have, at my suggestion, been carried on during the last few months with one well-known firm, with a view to their becoming the publishers of the Transactions; and although the particular correspondence referred to did not result in a satisfactory agreement, I trust that this most desirable step will not be lost sight of, and that before the next Anniversary comes it may be in the power of those naturalists who wish to obtain the

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Transactions to purchase them in London; and I would also advise that the publication of the several parts, as they come out, may in future be more fully advertised.

When we compare the first published list of members with the present roll, it is satisfactory to observe how large a number of the most worthy names still hold their place among us; while during the twenty years which have passed another generation of young and energetic workers has arisen and is now actively engaged in carrying on those investigations into the zoology, botany, and geology of the district which were begun and are still being pursued by the older members. Upon the whole death has dealt kindly by us since the establishment of the Club, and we still rejoice in the presence among us of most of the leading original members. Yet we have had to mourn the loss of many who could ill be spared from our ranks, who, either from their scientific attainments, or the genial spirit with which they delighted to promote the study of that which they believed to be advantageous to others, even if not especially pursued by themselves, took interest in our welfare, and aided the Club by their support at a time when such support was most needed. Reviewing, as I have done, the rise, and early and later progress of the Club, I should be omitting a most important feature did I not recall, however briefly, the names of those who have thus played important parts in the history and transactions of the Club. Of those gentlemen, who have had the honour of filling the Presidential Chair, all survive except four. These were Archdeacon Coxe, who took great interest, as has already been shown, in the foundation of the Club. He was elected President in 1848, and has been called away from us and from the large circle of friends by whom he was respected and beloved during the past year. Archdeacon Thorpe was President in 1852. Naturalists cannot but feel most grateful to him for the way in which, by checking the wholesale and wanton destruction of the sea birds on the Fern Islands, and protecting them more especially in the breeding season, he was the means of rescuing many interesting species from total extermination on this part of the coast, and of retaining for these little islands the interest which has so long been

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attached to them, as an important breeding place of sea fowl. Mr. William Kell, who was President for the years 1857 and 1858, at all times felt great interest in the Club, and during his Presidency did good service by the pains he took in conjunction with the Treasurer and Secretaries in getting the accounts of the Club, which were in much confusion at the time, into order. The fourth deceased President is Dr. Johnson, of Sunderland. We all remember the sad circumstances of his death, and how it pleased God, in 1861, to strike him down in a moment, when in the full vigour of apparent health and strength, in that very year in which we had marked our appreciation of the many high qualities which he possessed by electing him our President. Among others who are gone, and whose names should be remembered by us for the position which they held in our Club, may be mentioned Mr. Thomas Burnet, who for many years as Treasurer most carefully and prudently conducted the monetary transactions of the Club: he was fond of botany, though he made no pretension to be a scientific naturalist. Mr. Storey was for many years an active Secretary: he was also a good botanist, and at the time of his death was preparing a flora of the district. The name of Mr. Loftus must always be remembered as one of the notables of the Club. He was an excellent geologist, and for some time a Secretary of the Natural History Society. He was appointed on the Turko-Persian Commission, and spent four years under Sir W. F. Williams, of Kars (then Colonel Williams), in Asia Minor and Assyria. In 1853 he was again sent out by the Assyrian Society, to follow up those researches in Assyria which he had commenced on his former visit. On his return he published a very interesting volume, containing an account of his travels and researches in Babylonia, Chaldea, and Susiana. He subsequently went out on the staff of the Geological survey of India. His health however gave way: he set out to return to England, but died during the voyage. The name of Mr. George Burnett, an excellent chemist and mineralogist, should also be mentioned as having been intimately associated with the Natural History party of Newcastle. There are others whose names are often met with in the earlier Transactions of the Club, and who

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should not be passed by in an enumeration of those whose loss we have to deplore—Mr. Hutton, Mr. Fryer, and Mr. Sidney.

I have already mentioned the name of Archdeacon Coxe as that of one who has been called from among us during the past year. There is another member, whom we have just lost. I refer to Mr. John Thompson, who died at Gateshead on the 26th of March, at the good old age of eighty-eight. Mr. Thompson was in many respects a remarkable man, and a most worthy member of our Club. I am indebted to a friend, who has been acquainted with him during a lengthened period, for most of the particulars, which enable me to supply the following notes on his life. Thirty years ago John Thompson was a miller at Crowhall Mill, on the Tyne, near Haydon Bridge, as an assistant to his brother who had the mill. At that time he was known to the Newcastle naturalists as a good practical botanist, the discoverer of several rare plants new to the district, and as a man of information and tastes on other branches of science not usually met with in those in his position. The Rev. John Hodgson, the historian of Northumberland, and the Rev. Anthony Hedley, the antiquary, occasionally availed themselves of his information and assistance in exploring that part of the district. He had some ingenuity in mechanical contrivances, and my informant believes made his own lens for botanical purposes. While he lived in the country he was a good example of a man in the pursuit of knowledge under difficulties. On his brother leaving the mill he came into Newcastle to seek employment, and his kind friend, Mr. George Burnett, contrived to find for him a place to attend Locke Blackett and Co.'s lead yard, in the Close. Soon after this he married and retired—his wife having a little money of her own. Before the death of his first wife he removed to Gateshead, and afterwards married a second time; and it is gratifying to his friends to know that he enjoyed a comfortable though humble independence and kind nursing in his old age. He joined the Tyneside Club on its first formation, and was one of the most constant attenders at its Field Meetings, generally acting as the guide of the party over his favourite localities of Tyneside and the Northumberland lakes. In eighteen out of the twenty years'

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existence of the Field Club he has been elected a member of the Committee, and in one of the two remaining years, viz., in 1850, he had the honour of being appointed a Vice-President. He corresponded from time to time with many of the leading botanists of the day, among others with Sir W. J. Hooker, Wilson, Borrer, and Babington, and the two last named, when they were in the North, visited him for the purpose of obtaining information respecting some of the rare plants of Northumberland. With the death of Mr. John Thompson, a long familiar, pleasant, honest, homely face will be missed from among us; the face of one who made us honour him because he did honour to himself by turning to good account the talents which God had given him—

"Not chance of birth or place has made us friends,
Being oftentimes of different tongues and nations,
But the endeavour for the selfsame ends,
With the same hopes, and fears, and aspirations."

Enough of the past. It is time that I spoke of the present, and made known to you the amount of Natural History and Archæological work on which our members have been during the last year engaged, or which they are at the present time carrying on. In doing this I shall not allude to anything which has been read at our own Meetings, or has been printed in our Transactions, but only those works, memoirs, and papers which are at the present time in preparation, or have been recently brought out either as separate volumes, or in the transactions and proceedings of the various learned and scientific societies of Great Britain. It must be borne in mind, that any paper which does not strictly and exclusively refer to the Natural History or Archæology of the area comprised in the operation of the Field Club, has usually been considered inadmissible for publication in its Transactions. The bulk, therefore, and the more important part of the writings of our members, are necessarily sent elsewhere; and it is only by examining what these writings have been that we can become cognisant of the extent of real and substantial work in the cause of science, which is now being done in the North of England.

Mr. Alder has been actively engaged in the preparation of the work upon British Tunicata, which he has undertaken to write

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jointly with Mr. Albany Hancock for the Ray Society. The Monograph, when completed, will make us acquainted with a branch of marine zoology which is at the present time wrapped in much obscurity.

Mr. Atthey continues his researches into the remains of the fossil vertebrata of the Coal Strata; and there is reason to hope that the Transactions will before long be enriched by another contribution by Mr. Kirkby and himself upon this subject.

Mr. J. G. Baker has, we rejoice to say, been appointed "First Assistant in the Kew Herbarium," a position highly congenial to his tastes. During the past year he has published a Monograph on the British species of Mentha, and sundry miscellanea, in the "Manual of Botany;" and since he has been at Kew he has commenced an examination of the Filices of the collection, and as a first result has already contributed to the Linnean Society a memoir on certain new Hymenophyllaceæ. With undaunted vigour Mr. Baker and Mr. Tate have again set to work at the preparation of the Flora of the Counties of Northumberland and Durham to be published in our Transactions, the writing of which was already far advanced when the MS. was consumed, among Mr. Baker's other property, in the lamentable fire which destroyed his house at Thirsk. The first part of the Flora is promised us by the end of the present year.

Mr. T. J. Bold has been busy making fresh discoveries in that boundless study to which he devotes himself—the investigation of the Insect Fauna of Northumberland. During the past season he has found many species new to our local Fauna among the Coleoptera, but has been more especially applying himself to the examination of the Hemiptera, a class of insects of which British naturalists knew but little until Messrs. Douglas and Scott brought out, in 1864, the first volume of their able work upon the subject, published by the Ray Society.

Mr. G. S. Brady has been especially devoting himself to the elucidation of the Entomostraca belonging to the order Ostracoda. One paper, "*On new or imperfectly known Species of Marine Ostracoda*," is being printed in the forthcoming part of the Zoological Society's Transactions; and another, "*A Monograph of*

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the recent British Ostracoda," is ready for publication, and is about to be offered to the Linnean Society. Mr. Brady has also in preparation, in conjunction with Messrs. Crosskey and Robertson of Glasgow, a "*Monograph of the Post Tertiary Entomostraca*," which will be published by the Palæontographical Society.

Mr. H. B. Brady has in preparation a "*Monograph on the Crag Foraminifera*," which he is writing in conjunction with Messrs. Parker and Jones, and which will be the next volume published by the Palæontographical Society. Mr. Brady is also gathering material for a work on the "*Foraminifera of the Lias*," and the "Annals of Natural History," for last July, contained a joint paper, by Messrs. Jones, Parker, and Brady, "*On the Nomenclature of the Foraminifera, with Figures of D'Orbigny's Models*."

Mr. Browell has completed a valuable series of analyses of the Magnesian Limestone, from about sixty different beds, chiefly with reference to the proportions of lime and magnesia. The result of these analyses will appear in our Transactions, and it is not improbable that they may prove to have considerable geological interest.

Dr. Bruce has been passing through the press the third edition of his well-known work on "*The Roman Wall*." Much new matter will be embodied in this edition, which will be printed in quarto instead of octavo, and will be much more copiously illustrated than those which have preceded it.

The Rev. Wm. Greenwell has brought out a long paper on *British Tumuli in the North and East Ridings* in the Journal of the Archæological Institute, and another upon Cairns and other early remains in Argyleshire in the "Archæologica Scotica" of the Society of Antiquaries of Scotland; and also a third paper upon some North Northumberland sepulchral remains in the Transactions of the Berwickshire Club. In addition to these Mr. Greenwell has in preparation at the present time a book, which will be entitled, "*A Decade of Skulls from Ancient Northumbria*."

Mr. A. Hancock has produced one of his elaborately worked out anatomical papers, "*On the Anatomy of Doridopsis, a genus of Nudibranchiate Mollusca*." This memoir is published in the

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part of the Transactions of the Linnean Society which has just been issued. Doridopsis, most of the known species of which are Indian, is a genus closely allied in external character to Doris, but differs from the latter in the total absence of spicules, granules, or other calcareous bodies embedded in the dermal envelope, and still more in the different position of the mouth which is suctorial, and wholly devoid of tongue, spinous collar, or jaws. Mr. Hancock has however been especially devoting himself, during the past year, to the study of the anatomy and physiology of the Tunicata in preparation for the work, which, as has been already mentioned, he is about to bring out jointly with Mr. Alder.

Mr. G. Hodge has his "*Catalogue of the Echinodermata of Northumberland and Durham*" in a forward state of preparation, and it will at no distant period be ready for publication in our Transactions.

Mr. Howse has recently written two short papers for the Mining Institute of Newcastle, which have been published in their Transactions (Vols. XIII and XIV): the first of these is "*On the Glaciation of the Counties of Durham and Northumberland,*" the second "*On the Boundary Line between the Millstone Grit and Mountain Limestone in the North of England.*" These are two interesting papers on local geology, of the publication of which perhaps many of our members are in ignorance. Mr. Howse hopes to work this year on the Mountain Limestone, with the intention of cataloguing the fossils from the southern part of our district.

Mr. Kirkby has been already referred to as allied with Mr. Atthey in working up the animal remains of the Carboniferous Strata, with a view of giving us a complete illustrated account of them. This able geologist has also in hand a Monograph of the Carboniferous Entomostraca, in which work he is joined by Professor T. Rupert Jones.

I have myself had my time so fully occupied during the past year that there has been very little to give to the pleasure of Natural History, and I have as yet been unable to complete the second part of my paper "*On the Genera and Species of British*

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Echinodermata," the first part of which appeared in the Annals of February last year. Nor have I been able to make any progress, during the same period, with my promised "*Catalogue of the Cristacea of Durham and Northumberland.*" The only Natural History work, indeed, that I have done, was during my short summer holiday, when, having been appointed by the British Association one of the members of a Committee to examine the Marine Fauna of the Channel Islands, I accompanied Mr. Jeffreys and Mr. E. Ray Lankester to Guernsey, and dredged from thence among the Islands. The great strength of the currents and force of the tides, combined with the rockiness of the bottom, make dredging around Guernsey extremely difficult. The result however of the few weeks' work which the Committee did there was upon the whole very satisfactory, nearly forty animals previously unknown to the British Fauna were met with belonging to the classes Crustacea, Tunicata, Polyzoa, Actinozoa, Hydrozoa, Echinodermata, and Porifera. These last were submitted to Dr. Bowerbank for examination, and have been pronounced by him to be the richest collection of British Sponges he has ever examined. He has not yet quite completed their examination, but has already found among them seventeen species which are new to science.

Professor Oliver, owing to the death of Sir W. J. Hooker, has virtually gained a step at Kew, although he still retains his former designation of "Keeper of the Herbarium and Library of the Royal Gardens." He has during the year published a few short papers in the Proceedings of the Linnean Society; but his time has been chiefly occupied with a proposed "*Flora of Tropical Africa*," which Government proposes to bring out. The first volume of this Flora is not as yet quite ready for the press.

The Rev. H. B. Tristram has been extremely active with his pen in making known some of the results of his scientific expedition to Palestine. "*The Land of Israel*," which has been most favourably reviewed, gives us a general insight into the scope of his travels. In the "*Proceedings of the Zoological Society*" we find the following papers—

Report on the Birds of Palestine.

Report on the Fishes and Reptiles of Palestine.

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Report on the Terrestrial and Fluviatile Mollusca of Palestine.
Report on the Mammalia of Palestine.

In the *Linnean Proceedings* Mr. Tristram gives us a *Few Botanical Notes on Palestine;* in *The Ibis* he is at the present time bringing out a series of papers, as yet not nearly completed, "*On the Ornithology of Palestine;*" and yet further, this active writer has undertaken to prepare for publication, by the Ray Society, "*A Synopsis of the Fauna and Flora of Palestine.*"

Lastly, Mr. George Wailes promises us the early completion of his Catalogue of Lepidoptera, the first part of which was published in the third volume of our Transactions.

We thus see that we are actively engaged in pursuing the several lines of investigation which we have chosen for ourselves; and probably at no previous time have the naturalists of our district had so much scientific work in hand, or contributed so largely in a single year to the literature of Natural History.

FIELD MEETINGS were arranged to be held as follows during the ensuing season:—

MAY..... Warkworth and Acklington.
JUNE ..... Easington and Fox-hole Dene.
JULY ..... Woodburn and Sweethope.
AUGUST ..... Saltburn.
SEPTEMBER ... Rochester and Chattlehope.
OCTOBER ..... Marsden.

PROFESSOR SEDGWICK, of Cambridge, was elected an honorary member of the Club.

The Treasurer's report (see p. 267) was read and adopted.

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The following gentlemen were elected officers for the year 1866–7 :—

President.

The Rev. J. C. Bruce, LL.D.

Vice-Presidents.

Albany Hancock, Esq., F.L.S.	G. C. Atkinson, Esq.
R. S. Newall, Esq., F.R.A.S.	Richard Howse, Esq.

Ralph Carr, Esq.	J. Hogg, Esq., M.A., F.R.S.
Rev. J. F. Bigge, M.A.	Rev. H. B. Tristram, M.A.
Joshua Alder, Esq.	George Wailes, Esq.
D. Embleton, Esq., M.D.	Rev. W. Greenwell, M.A.
R. Ingham, Esq., M.P.	Edward Charlton, Esq., M.D.
Sir W. C. Trevelyan, Bart.	Rev. G. C. Abbes, M.A.
T. Sopwith, Esq., F.R.S.	Rev. A. M. Norman, M.A.
Rowland Burdon, Esq.	

Treasurer.

Robert Y. Green.

Secretaries.

George S. Brady. | Thomas Thompson.

G. H. Philipson, M.D.

Local Secretaries.

Shields, W. H. Brown.	*Hexham*, Rev. W. T. Shields.
Durham, John Booth.	*Morpeth*, W. Creighton.

Committee.

Joseph Blacklock.	John Daglish.
E. J. J. Browell.	James W. Dees.
D. O. Brown.	William Dinning.
R. B. Bowman.	John Hancock.
H. B. Brady.	George Hodge.
James Clephan.	G. C. Pecket, Jun.

Auditors.

Henry Turner. | J. S. Foster.

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The following gentlemen have been elected members of the Tyneside Naturalists' Field Club during the past year:—

At the Anniversary Meeting, 1865:—Messrs. W. E. Branford, Richard Lowrey, Donald Fraser, Thomas Watson, William Maling, Rev. Jas. Crolley, Newcastle; J. R. Appleton, Durham; G. M. Tweddell, Stokesley; Robert Draper, Seaham Gardens; Rev. Alex. Maclennan, Bishopwearmouth; Robert Thubron, Tyne Docks; Rev. G. M. Gourley, Blanchland; William Moffatt, North Shields.

At the First Field Meeting:—Messrs. G. H. Fenwick, E. Glynn, Jun., Robert Pauling, Newcastle; John Carr, North Shields; William Hobkirk, Cramlington; B. J. Sutherland, Newcastle; John Wilson, John Twizell, Richard Donkin, North Shields; James Eglinton, Sunderland; Matthew Procter, Killingworth; Dr. Foote, Bishopwearmouth.

At the Second Field Meeting:—Messrs. H. J. Poole, Blaydon; John Forster, Winlaton; Thomas Stokoe, Thomas Cooke, Robert Johnston, George Nesbitt, Newcastle; E. J. Wilson, Gateshead; John Marsters, Sunderland; H. Scholefield, Low Heaton House.

At the Third Field Meeting:—Rev. W. H. Wardell, Winlaton Rectory; David Reid, Jun., Newcastle; Rev. J. B. Dykes, Durham; Thomas Craggs, Gateshead; Rev. G. R. Hall, Birtley.

At the Fourth Field Meeting:—Messrs. Edward Hutchinson, Newcastle; Joseph Forster, Edward Evans, Sunderland; J. M. Hicks, Gateshead; Thomas Jackson, North Shields.

At the Fifth Field Meeting:—Messrs. W. M. Henzell, W. H. Inness, Newcastle; W. Tone, Jun., Sunderland.

At the Sixth Field Meeting:—Messrs. W. O'Brien, M.D., South Shields; H. Yellowley, Newcastle; P. Brown, M.D., Blaydon; John Byers, Robert Hudson, Sunderland; William Nicholson, Winlaton; W. D. Cameron, Tynemouth; George

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Newbigen, Bensham; Thomas Steel, Sunderland; Edward Richardson, T. E. Watson, J. M. Macdonald, Robert Henderson, J. G. Youll, Robert Dickinson, Rev. J. C. Street, Newcastle; J. A. Stevenson, Gateshead.

At the First Evening Meeting:—Messrs. W. C. Robson, Newcastle; Joseph Cowen, Jun., Stella House; Robert Bell, South Shields; G. C. Pecket, Sunderland; Henry Downie, Newcastle; Frank Marshall, Jarrow Iron Works.

At the Second Evening Meeting:—Messrs. William Clay, J. G. Dickinson, John Greaves, M. Henderson, John Brown, J. G. Allison, Rudolph Knothe, Newcastle; Dr. Grierson, Thornhill, N.B.

At the Third Evening Meeting:—Messrs. W. Tidswell, Thos. Waddington, Newcastle.

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THE TREASURER IN ACCOUNT WITH THE TYNESIDE NATURALISTS' FIELD CLUB.

Dr.

1865.	£	s.	d.
To Balance	13	12	7
" Entrance Fees and Subscriptions	155	15	0
" Subscription of Nat. Hist. Soc., 1864–5	10	0	0
" Ditto ditto, 1865–6	10	0	0
" Excess of Associates' Subs., 1864–5	2	0	0
" Ditto ditto, 1865–6	4	10	0
" One Hundred and fifty-nine Parts of Transactions, at £12 per Hundred	19	0	0
" Half of Joint Accounts	9	1	0
	£223	18	7

Cr.

1865.	£	s.	d.
By Printing Transactions	51	0	0
" Plates	59	18	6
" Printing Notices, &c.	25	9	4
" Postage	28	11	5
" Commission, collecting	7	9	9
" Nat. Hist. Soc., Rent of Room, 1864–5	10	0	0
" Ditto ditto, 1865–6	10	0	0
" Petty Expenses	3	1	1
" Balance	28	8	6
	£223	18	7

April 19th, 1866,

Examined and found correct,

(Signed) HENRY TURNER, J. S. FOSTER, } AUDITORS.

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REPORT OF THE COMMITTEE

OF THE

NATURAL HISTORY SOCIETY,

READ AT THE ANNIVERSARY MEETING, APRIL 26TH, 1866,

R. S. NEWALL, ESQ., F.R.A.S., VICE-PRESIDENT, IN THE CHAIR.

In presenting their report to the Society, the Committee would remark at the outset, that the period to which it refers is somewhat longer than usual, upwards of eighteen months having elapsed since the last Anniversary Meeting. The explanation of this lies in the arrangements for coöperation between this Society and the TYNESIDE NATURALISTS' FIELD CLUB, which render it desirable that the times for holding the annual meetings of the two bodies should be approximated as nearly as may be. The rules of the Society provide that our Anniversary should be held in the Assize-week, in the August of each year, but as the time for holding the Assize Courts has been changed, this is no longer practicable, and as some alteration has become necessary, it has been found productive of less inconvenience to modify our rule than to change the practice of the FIELD CLUB. In the joint publications of the two Societies the report of the Committee of the NATURAL HISTORY SOCIETY should obviously be associated with the address of the President of the FIELD CLUB, as the two documents taken together afford a fair means of judging the state of Natural History interests in the northern counties.

Your Committee have but little to remark touching the general operations of the Society. The number of visitors to the Museum, and the income derived from the payments at the door, slowly but steadily increase. The behaviour of those admitted

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is uniformly orderly, and the interest manifested in the collections continues to be a gratifying feature.

The WINTER EVENING MEETINGS, two series of which have been held since the last report, have now an established footing, and though the attendance of non-members has never been quite as numerous as the Committee anticipated on their commencement, three winters ago, nor indeed quite sufficient to cover the expenses they entail, they fulfil an important office in the dissemination of Natural History information, and have done perhaps more than anything else to raise the estimation in which the Society is held by the public; in addition to this, the opportunities they afford for the social gathering of the members and associates is an advantage not to be lost sight of.

The arrangement for coöperation with the TYNESIDE NATURALISTS' FIELD CLUB in respect to scientific meetings, and the publication of Transactions, have been found to answer admirably. The number of members of the FIELD CLUB who have entered your Society as associates, under the new regulations, has been somewhat over a hundred last year. The first part of the joint Transactions of the two bodies has been issued, and will, it is believed, fairly maintain the credit of north-country naturalists.

The number of members continues slowly to increase rather than diminish, though far short of what it ought to be. If the members of the Society would only use their influence more generally amongst their friends, to induce them to support its funds, a sphere of usefulness would be open to it to which it cannot aspire with its present limited income.

The Treasurer's statements are appended to this report. The first is for the old financial year ending in August last, the second carries the accounts up to December 31st, to which date in future it is proposed to make up the accounts. The expenditure of the Society has been carefully kept within its income, and the small floating debt is now being annually diminished.

The necessity for alteration in some of the rules of the Society has been prominently brought under the notice of your Committee, and a schedule of amended rules, drawn up by a Subcommittee, to whom the matter was entrusted, and approved by

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a recent meeting, will be submitted to you. The modifications which the changes of the last thirty years have rendered necessary in the mode of conducting the Society's business have had no corresponding amendments in the rules, and the result has been that for some time past the Committee has been compelled to act from precedent rather than from book. If the proposed amendments should meet with approval from the Society, it will be the duty of the in-coming Committee to take the necessary steps for insuring their legality.

A list of recent donations to the Museum and Library is appended to this report. It is very similar both in point of the number and value of the contributions to the lists of past years, and does not seem to embrace anything worthy of special mention.

The additions to the Museum by purchase have been few and unimportant, and except a set of glass models of the Actiniæ of German manufacture, affording a means of representing a class of animals hitherto unrepresented in our Museum, there is nothing to which the attention of the members need be directed.

Your Committee believe that though there are but few striking events in the history of the Society since their last report, that it has been steadily and quietly progressing, and that it has fulfilled to the utmost, with the means at its command, the offices contemplated by the founders thirty-seven years ago.

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RALPH BROWN, ESQ., TREASURER, IN ACCOUNT WITH THE NATURAL HISTORY SOCIETY.

Dr. 1864.	£	s.	d.	Cr. 1864.	£	s.	d.
To Balance from last Acc.	106	4	0	By Keeper's Salary	75	0	0
" Subscriptions	168	1	0	" Sundries, per Joseph Wright	75	2	3
" Mining Institute	20	0	0	" J. G. Foster.....	5	10	0
" Amount received for Admissions	137	7	2	" Advertising	7	15	4
" Lit. and Phil. Society	40	0	0	" E. B. Reed	162	4	0
" Cash, per G. Mennell	5	18	2	" Austin & Johnson ...	12	11	9
" Rent for Sign Board...	2	0	0	" Richardson & Co. ...	49	0	0
" Distr. Bank Dividend	36	12	6	" Richard Howse	7	0	0
" Ditto ditto	9	3	2	" Fire Insurance.....	10	5	7
" Donation from Microscopical Society ...	11	1	0	" Balance of Building Fund.....	51	2	5
" Fine Arts Society.....	34	12	0	Balance brought Forward	116	5	2
" Anonymous	0	15	0				
	£571	16	6		£571	16	6
To Balance in the hands of Treasurer £116	5	2					

RALPH BROWN, ESQ., TREASURER, IN ACCOUNT WITH THE NATURAL HISTORY SOCIETY.

Dr. 1865.	£	s.	d.	Cr. 1865.	£	s.	d.
To Balance from last Acc.	116	5	2	By Keeper's Salary	31	5	0
" Subscriptions	32	7	0	" Sundries per Wright,	14	14	2
" Amount received for Admissions	53	4	6	" E. B. Reed	5	12	0
" Fine Arts Society.....	17	6	0	" Richardson & Moor...	8	7	6
" Lit. & Phil. Society...	40	0	0	" John Clayton	100	0	0
" Mining Institute	20	0	0	" T. Grey and others...	10	6	0
				" Thomas Bates	5	5	6
				" Balance	103	12	6
	£279	2	8		£279	2	8
To Balance in the hands of Treasurer £103	12	6					

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OFFICERS OF THE NATURAL HISTORY SOCIETY,

ELECTED AT THE ANNIVERSARY MEETING,

APRIL 26TH, 1866.

PATRON.

His Grace the Duke of Northumberland.

PRESIDENT.

The Lord Bishop of Durham.

VICE-PRESIDENTS.

P. J. Selby, Esq.
Sir Walter C. Trevelyan, Bart.
The Rt. Hon. the Lord Ravensworth.
The Rt. Hon. the Earl of Tankerville.
Sir W. G. Armstrong, C.B.
A. J. B. Cresswell, Esq.
John Clayton, Esq.
Matthew Bell, Esq.
Venerable Archdeacon Prest.
Lieut.-Col. Addison Potter.
The Worshipful the Mayor of Newcastle.
John Hodgson Hinde, Esq.
Ralph Carr, Esq.
Robert Ingham, Esq., M.P.
Rev. John F. Bigge.
Edward Charlton, Esq., M.D.
I. Lowthian Bell, Esq.
Joshua Alder, Esq.
R. S. Newall, Esq.
G. C. Atkinson, Esq.

TREASURER.

Ralph Brown, Esq.

SECRETARIES.

Mr. J. Blacklock. | Mr. H. B. Brady.

COMMITTEE.

Mr. T. Bell.
Mr. R. B. Bowman.
Mr. E. Boyd.
Mr. D. O. Brown.
Mr. J. Coppin.
Mr. J. Daglish.
Mr. R. R. Dees.
D. Embleton, M.D.
Mr. A. Hancock.
Mr. J. Hancock.
Mr. H. T. Mennell.
Wm. Murray, M.D.
G. H. Philipson, M.D.
Mr. J. Rogerson.
Mr. C. Thompson, Jun.

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HONORARY CURATORS.

ZOOLOGY.

VERTEBRATA.

E. Charlton, M.D.
D. Embleton, M.D.

A. Hancock.
J. Hancock.

ARTICULATA.

T. J. Bold.
G. S. Brady.
W. Dinning.

J. Hancock.
Geo. Hodge.
Rev. A. M. Norman.

MOLLUSCA.

J. Alder.
Rev. A. M. Norman.

A. Hancock.

RADIATA.

J. Alder.
H. B. Brady.
D. O. Brown.

Geo. Hodge.
J. Coppin.
Rev. A. M. Norman.

BOTANY.

Rev. J. F. Bigge.
R. B. Bowman.

G. S. Brady.
H. B. Brady.

GEOLOGY.

J. Alder.
E. Boyd.
E. J. J. Browell.

J. Daglish.
J. W. Kirkby.

MINERALOGY.

Henry Bowman.
E. Charlton, M.D.

A. Freire-Marreco.

GENERAL CURATOR.

Richard Howse.

KEEPER OF THE MUSEUM.

Joseph Wright.

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LIST OF
DONATIONS TO THE LIBRARY AND MUSEUM
OF THE
NATURAL HISTORY SOCIETY,
FROM AUGUST, 1864, TO APRIL, 1866.

Annual Reports of the Smithsonian Institute, for 1862 & 1863.
Smithsonian Contributions to Knowledge, 4to., Vol. XIII.
Smithsonian Miscellaneous Collections, 8vo., Vol. V.
Meteorological Observations, Vol. II, Part 1.
Lecomtes' List of the Coleoptera of North America, Part 1.
Lecomtes' New Species of North American Coleoptera, Part 1.
The Smithsonian Institute, Washington U.S.A.

Annual Report, 1863, of the Trustees of the Museum of Comparative Zoology, Cambridge, Mass., U.S.A. *The Trustees.*

Proceedings of the American Philosophical Society, Philadelphia, U.S.A., Vol. IX, Nos. 70, 71, 72. *The Society.*

The Canadian Naturalist and Geologist, Vol. I, New Series, Nos. 1–6. *The Natural History Society, Montreal, Canada.*

Proceedings of the Zoological Society of London, 1864. *The Society.*

Library Catalogue of the American Philosophical Society, Philadelphia. *The Society.*

Twenty-five Parts of the Transactions of the Imperial Botanico-Zoological Society of Vienna. *The Society.*

Reports, 1864 & 65, of the Belfast Field Naturalists' Club. *The Club.*

Memoir on some Foraminifera from the North Atlantic and Arctic Oceans, by W. K. Parker, F.Z.S., and Professor T. R. Jones, F.G.S. *The Authors, per H. B. Brady.*

Report of the Fisheries Commissioners and Minutes of Evidence. *Rev. R. F. Wheeler, Whitley.*

Notes on Gebel Hauran and the Eastern Desert of Syria, by John Hogg, Esq., F.R.S. *The Author.*

Notes on some Amphibians, by John Hogg, Esq., F.R.S. *The Author.*

Memoirs on various Natural History Subjects from University of Christiania. *Per Dr. Charlton.*

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A Catalogue of British Land and Fresh Water Shells, by H. K. Jordan.
Joshua Alder, Esq.

Transactions of the Nova Scotian Institute of Natural Science, Vol. I, Part 1.
The Institute, per Mr. Thomas Belt.

A Specimen of the Water Vole (*Arvicola amphibius*), black variety, taken at Penkill, Ayrshire. *W. B. Scott, Esq., London.*

A Specimen of the Oared Shrew (*Sorex remifer*), found near Norton.
John Hogg, Esq., F.R.S., Norton.

A Specimen of the Field Vole (*Arvicola agrestis*). *G. S. Brady, Esq.*

A Skin of the Baboon, and a Specimen of the Common Fox.
Mr. James Stephenson, Sheriff Hill.

A Specimen of the Dusky Paca (*Cœlogenus subniger*).
Sir W. C. Trevelyan, Bart.

A Specimen of the Lesser Ant Eater (*Myrmecophaga*, sp.)
John Hancock, Esq.

The Skin of an Albatross (*Diomedea exulans*).
C. M. Adamson, Esq., Craw Hall.

A Collection of Bird Skins, from Palestine.
Rev. H. B. Tristram and Hugh Bowman, Esq.

A Collection of Bird Skins, from Palestine. *Hugh Bowman, Esq.*

A Specimen of the Oyster Catcher (*Hæmotopus ostralegus*).
Mr. Wm. Hepple, Wellington Terrace.

A Specimen of the Puffin (*Mormon patercula*); immature.
Mr. Thomas Thompson.

A small Collection of Bird Skins from Africa, including a Specimen of *Falco Dickinsonii*. *Mrs. Dickinson, Jarrow.*

Two Specimens of the Teal (*Anas crecca*), male and female.
Mr. John Thompson, Brayton.

A Specimen of the Peregrine Falcon (*Falco peregrinus*), immature female.
H. Hill, Esq., per John Hancock, Esq.

A package, containing forty-two Skins of British Birds.
John Hancock, Esq.

A Specimen of the Knot (*Tringa Canutus*). *Mr. Thomas Thompson.*

A Specimen of the Curlew (*Numenius arquatus*), white variety, shot at Broadstrother, near Wooler. *Henry Parker, Esq., Low Elswick.*

A Collection of Bird Skins, from India. *Mr. Brooks.*

Several Specimens of British Birds, shot in the neighbourhood of Winlaton.
Cuthbert Thompson, Jun., Esq.

Skin of a Nightingale (*Sylvia luscinia*). *Mr. Thomas Craster.*

A Tortoise and Egg, from Trinidad. *Sir W. C. Trevelyan, Bart.*

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A Specimen of the Iguano, from Gibraltar.
G. H. L. Hawks, Esq., Washington.

A Collection of thirty-two Specimens of British Fishes.
Rev. J. F. Bigge, Stamfordham.

A Specimen of the Miller's Thumb (*Cottus gobia*). *Mr. Thos. Thompson.*

A small Collection of Foreign Beetles. *Rev. Joseph Robson Honeyburn.*

A Wasp's Nest. *Mr. E. Hownam, Grainger Street.*

A Wasp's Nest. *Mr. John Stawart, Slatyford.*

Two Hermit Crabs (*Pagurus cuanensis*), from Cullercoats.
Joshua Alder, Esq.

A Specimen of the King Crab (*Limulus* sp.), from the Zoological Gardens, Hamburgh *W. K. Lloyd, Esq.*

A Specimen of *Cidaris papillata*, from Shetland.
J. G. Jeffreys, Esq., per Jos. Alder, Esq.

Several Specimens of the Sea Cucumber (*Cucumaria communis*).
Joshua Alder, Esq.

A large Collection of Echinodermata, from the Northumberland and Durham Coasts. *Mr. George Hodge, North Jesmond.*

A packet of Shells, from various localities. *R. Y. Green, Esq.*

A few Specimens of *Anomia ephippium*. *Ditto.*

A few Specimens of *Helix lapicideæ*, from Dieppe. *Ditto.*

A few Specimens of *Bulimus acutus*, from Islay. *Ditto.*

A few Specimens of *Driessena polymorpha*. *Professor Rolleston, Oxford.*

A few Shells from the coast of Ireland; also, a few from near Yarmouth.
D. O. Brown, Esq., Jarrow Hall.

A few Specimens of *Crania anomala*, and various species of *Lepralia*, from Shetland. *Joshua Alder, Esq.*

A number of Sponges, from Whitley. *Mr. William Dinning.*

Fresh Water Sponges. *D. O. Brown, Esq.*

A Specimen of *Filograna implexa*, from Cullercoats.
Mr. Joseph Philipson.

A small Collection of British Cryptogamic Plants.
Sir W. C. Trevelyan, Bart.

A copy of Drummond's "*Musci Scotici*." *Ditto.*

Fas. I. Baxter's "*Stirpes Cryptogamæ Oxoniensis*." *Ditto.*

A Specimen of *Lepidodendron*, from Fire Clay Drift, Scotswood, and a Specimen of *Stigmaria*, from the Beaumont Seam, Montague Colliery.
Mr. Thomas Henderson, Scotswood.

Four Slabs of Carboniferous Limestone containing Encrinites, from Richmond, Yorkshire. *D. Embleton, Esq., M.D.*

Four Specimens of Fossil Fish, from the Old Red Sandstone, Stromness.
Thomas Blain, Esq., Sunderland.

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Three Slabs of Slate, containing fine Specimens of Trilobites from Caen y-Coed Quarry, Maenturog, Carnarvon. *R. S. Newall, Esq.*

Portion of a Skull of *Bos longifrons*, found in making an excavation at Anatsford, near Seghill. *John Clayton, Esq.*

A Specimen of *Sternbergia*, from a quarry at Elswick. *Mr. Thomas Robson, Elswick.*

Specimens of Trilobites, from Dolgelly, North Wales. *Mr. Thomas Belt, Dolgelly.*

A number of Horn-cores of Oxen and a Bone Needle, found in making an excavation in Westgate Street. *Mr. W. T. Moor, Library Place.*

A Collection of Shells, from the Glacial Beds of the Clyde. *Rev. H. W. Crosskey, Glasgow.*

A number of Vegetable Fossils, from the Coal Measures, at Gateshead Fell. *John Hancock, Esq.*

Two Specimens of *Calamites*, from Wideopen Quarry. *Mr. W. C. Robson.*

Specimens of Gypsum, from a bed of clay, South Shore, Gateshead. *Mr. W. Brady.*

Specimens of Minerals, from various localities. *H. B. Brady, Esq.*

Three Specimens of Gold Quartz. *W. Arras, Esq., Warwick Bridge.*

A Bottle of Gulf Weed. *Mr. Henry T. Carr, Shieldfield.*

A young Sturgeon. *Rev. Joseph Robinson, Thorneyburn.*

Specimens of several Snakes. *Ditto.*

A Teal's Nest. *Mr. W. Foggin, Villa Place.*

A Partridge's Nest. *Mr. John Stawart, Slatyford.*

A Bottle of Water from Kerguelen's Land. *Edward Charlton, Esq., M.D.*

Bones of an *Ornithorhynchus*. *Ditto.*

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AMENDED RULES OF THE
NATURAL HISTORY SOCIETY
OF
NORTHUMBERLAND, DURHAM, AND NEWCASTLE-ON-TYNE.

THE following revised Code of Rules, embodying several alterations in that adopted at the foundation of the Society, in 1830, was brought up by the Committee at the Anniversary Meeting of the NATURAL HISTORY SOCIETY, held April 26th, and agreed to. It was finally sanctioned at a Special General Meeting summoned for the purpose, June 19th, 1866.

For the original Rules, see Report of 1830-1831, and copy of trust deed appended to Report of 1835.

MEETINGS.

1.—The Annual Meeting of the Society shall be held on such a day in the first week in February, as shall be deemed most convenient by the Committee.

2.—General Meetings shall be held in conjunction with the evening Meetings of the TYNESIDE NATURALISTS' FIELD CLUB, at such times as shall be decided by the Committee, at which Meetings scientific communications shall be received, subjects of science discussed, and donations to the Museum exhibited.

3.—Special and general Meetings of the Society shall be held at such times as shall be decided by the Committee.

4.—Ordinary members only shall have the right of voting at the Meetings of the Society.

5.—Questions proposed at a Meeting shall be determined by a majority of votes; and if the votes be equal, the Chairman shall have a second or casting vote.

OFFICERS AND COMMITTEE.

1.—The Patron, President, and Vice-Presidents shall remain in office so long as they continue Members of the Society, and a

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Treasurer, two Secretaries, and a Committee of fifteen, including two members of the Mining Institute, as provided in the agreement with that body, shall be chosen out of the ordinary Members every year, at the Anniversary Meeting, by the vote of the majority of those present. To them shall be entrusted the expenditure of the funds and the entire management of the affairs of the Society.

2.—The Patron, President, Vice-Presidents, Treasurer, and Secretaries shall be *ex-officio* members of the Committee.

3.—The Committee shall meet on the summons of the Secretaries once a month, or at such times as there may be business requiring their consideration. Three shall be a quorum.

4.—Questions proposed in the Committee shall be decided by a majority of votes; and if the votes be equal, the Chairman shall have a second or casting vote.

5.—The Committee shall appoint Honorary Curators, who, with the officers of the Society, shall have the superintendence and arrangement of the several departments of the Museum, and shall prepare catalogues of the same, if deemed necessary.

6.—Previous to the Annual Meeting the Curators shall report to the Committee on the additions made in the course of the year in their respective departments.

7.—The Committee shall present to the Annual Meeting a report of the condition of the Society's funds, the state and progress of the collections, and the general advancement of the objects of the Society. Such report, if approved by the Meeting, shall be printed and sent to the Members.

ELECTION OF MEMBERS AND ASSOCIATES.

1.—Every person desirous of becoming a member of the Society must be recommended, in writing, by three subscribing members; on being so recommended, he shall be balloted for by those present, either at a Committee Meeting, a General Meeting, or at the Anniversary Meeting of the Society; if three-fourths of the votes given be in the affirmative, he shall be declared duly elected, and, upon payment of the subscription, shall become a member of the Society.

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2.—Members of the TYNESIDE NATURALISTS' FIELD CLUB may become Associates of this Society (so long as the present arrangement between the Society and the TYNESIDE NATURALISTS' FIELD CLUB exists) upon payment of the subscription hereinafter mentioned. Such Associates shall have free access to the Museum whenever it is open to the public, and to the Evening Meetings and Soirèes on the same terms as ordinary members; but they shall not be entitled to attend the business Meetings of the Society, or be elected to any offices thereof except as Honorary Curators of the collections; nor shall they possess any interest in the collections or other property of this Society.

3.—Honorary members shall be proposed by three ordinary members and voted for, as above, at the same Meeting.

4.—Any member proposing to resign shall notify the same to the Secretaries, in writing, at or before the Anniversary Meeting.

PAYMENTS BY MEMBERS AND ASSOCIATES.

1.—Every ordinary member shall pay to the Treasurer a sum of not less than One Guinea annually: such subscription to be paid in advance, and to be due on the first day of August in each year.

2.—Every Associate, being a member of the TYNESIDE NATURALISTS' FIELD CLUB, shall pay to the Treasurer a sum of Five Shillings annually, in advance, due on the said first day of August in each year.

3.—A member may compound for his future annual subscription by a payment of Fifteen Guineas; and having so compounded, he shall be entitled to all the privileges of an ordinary member.

4.—If any member do not pay his subscriptions for three years, and further neglect it for three months, after notice thereof shall have been sent to him, he ceases to be a member. If subsequently proposed for re-election, he must discharge all arrears due from him when he ceased to be a member of the Society.

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XXV.—*Ornithological Notes.* By JOHN HANCOCK.

THE beautiful and occasional visitant of the British Isles, the Waxwing, *Bombycilla garrula*, Linn., has made its appearance this winter (1866–7) in considerable abundance within our district.

In the last week of November I received a fine specimen of this bird from Sir W. G. Armstrong, C.B., which was shot in the neighbourhood of Rothbury along with four or five others, most of which were unfortunately destroyed by a cat.

About the same time (27th November) I see that the "Teesdale Mercury" records the capture of five specimens at Stanhope.

In the "Newcastle Daily Journal" of the 4th December is the following paragraph—"At Broomhouse, on Tuesday, Mr. Embleton shot three Bohemian Waxwing Chatterers, and the following day three more of the same."

I am informed by Mr. J. H. Gurney, Jun., that about this time seven of these interesting birds were shot at Berwick, four at Durham, three at Norton Close, near Darlington, sixteen at Stanhope, and eight at Alnwick; and according to the Rev. Mr. Tristram, a single individual was taken at Wynyard, and two at Castle Eden.

Lately my friend Mr. T. Thompson drew my attention to the fact, that ten Bohemian Chatterers had been killed between Stella and Ryton from the 15th to the 30th December.

On the 16th January I visited the locality in company with that gentleman. We called upon Mr. Scott, a bird stuffer, living at Blaydon, and saw in his possession fifteen specimens, ten being those alluded to by Mr. Thompson, the five additional being fresh captures. They were shot near some mountain ash trees, close to the village.

When in the neighbourhood we heard of two others which had been shot at Winlaton Mill, on Saturday, 12th January. These I obtained in a fresh state, and they now form part of my collection. I have been informed by Mr. Rowell, that early in February, seven of these birds were shot out of a flock of eight at Little Harle, near Cambo; and on the 18th of February I

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received a single specimen from J. C. Anderson, Esq., which was found dead on the shore of North Tyne, near Lee Hall.

Thus we find recorded eighty-two captures of the Waxwing within our district. These however are apparently but a small portion of the number which have fallen a sacrifice to the too ardent affection of their admirers! These beautiful birds have been slaughtered in almost every part of England; and I am informed by my friend, Mr. Gurney, that in Norfolk alone ninety specimens were killed.

It is certainly painful to see the wholesale destruction of these charming visitants; but it is nevertheless rather amusing to read in certain prints expressions of indignation at such extensive slaughter—the writers at the same time pointing out the desirability of rather inducing these interesting strangers to take up their residence with us. Such remarks betray much ignorance as to the nature of these chance migrations. The utmost slaughter that can take place on these occasional visits cannot tend, in the least perceptible degree, to diminish the aggregate number of these species, and a very little knowledge of Natural History suffices to show that these birds must return to the homes from whence they have come. The Chatterer, for instance, is compelled, by its economy and instincts, to retire to the far North for a breeding station; and the Sand Grouse, which appeared in such vast numbers on our shores two or three years ago, is adapted by its organization to an arid country, and appears but ill-suited to our humid climate.

It would be well, however, if such sympathizers with the sufferings of the feathered tribes would raise their voices against the lamentable destruction of our finest and most ornamental *home birds*, perpetrated by game-keepers, under the sanction of their masters, whose better educated tastes might be supposed to tend to a just appreciation of the beauties of nature. The larger and most interesting of the feathered inhabitants of our woods, plains, and uplands, are rapidly disappearing, and will before long cease to exist as a feature in the rural scenery of our country.

If the whole of the chance visitants to our shores were shot

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down, or if ten times their number fell a sacrifice to the bird fanciers' thirst of acquisition, the injury thus done to the interest of our country rambles could not be compared to that resulting from the never-ceasing, and to a great extent, unnecessary havoc inflicted on our native birds by game preservers.

But to return to the subject of our pretty strangers. The Chatterers make their appearance with us at very irregular periods. I find by my memoranda that the last time they visited our district, in any number, was in the year 1850. Then fifteen were taken in the immediate neighbourhood of Newcastle, four of which came into my possession. I also have to record that a specimen was shot in Northumberland, November, 1863; and I find by a Carlisle journal, "that an individual of this species was shot from a flock at Newby Cross, on the 20th November, 1853."

Little Bittern, *Ardea minuta*, Linn.—A mature specimen of this rare bird was shot at Benridge by the keeper, on the 31st May, 1866, and is now in the possession of Mr. C. M. Adamson.

Ivory Gull, *Larus eburneus*, Linn.—On the 15th February I saw a fine mature Ivory Gull. It was obtained by Mr. E. Crawshay, at Islay, on the west of Scotland, about the 12th February, 1867. The bird was in very poor condition, and had no appearance of having been shot.

Black Kite, *Milvus ater*, Linn.—A fine mature male of this bird came into my possession, in a fresh state, on the 11th May, 1866. It was taken in a trap by Mr. F. Fulger, the Duke of Northumberland's game-keeper, a few days before, in the Red Deer Park, at Alnwick.

This is, I believe, the first occurrence of this fine rapacious bird in Britain. The plumage was in a very good condition, except on the lower part of the body, where it had sustained some injury from the trap. It was proved to be a male by dissection. In every respect the plumage agrees with mature specimens in my collection, which I received from the Continent some years ago.

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DALMATIAN REGULUS, *Regulus modestus*, Gould.—I shot a small species of Wren at Hartley in September, 1838, and shortly afterwards gave a notice of the capture in the Annals of Nat. Hist., Vol. II, p. 310, identifying it with the *Regulus modestus* of Gould; but I now find that there are two closely allied species, and that my bird is distinct from that described by Mr. Gould.

The Rev. Mr. Tristram has kindly favoured me with a view of a series of specimens of both the species. The one is distinguished from the other chiefly by a broad pale yellow belt across the rump, and that gentleman informs me that the species so characterized was described by Pallas under the specific denomination of *proregulus*, and the other species is given by Gmel, under the name of *supercilliosus*. Now, my specimen has no such band across the rump; while that figured by Mr. Gould possesses this character. My bird therefore must stand under the name of *Reguloides supercilliosus* (Sp.), Gmel. Gould's name will have to drop into a synonym of *Reguloides proregulus* (Sp.), Pall.

XXVI.—*Meteorological Report for* 1866. Edited by the Rev. R. F. WHEELER, M.A.

January.—Otterburn.—Snow from 8th to 13th.

Bywell.—A lunar halo was seen on 30th, and again on 31st.

Wylam.—An exceedingly changeable month: one day very fine; very coarse the next. A good deal of sudden and often violent wind. The fluctuations of the mercury in the barometer were great and sudden, the general tendency upwards from 28·510 on the 9th, to 30·392 on the 24th, when it fell suddenly and continued depressed till the end of the month.

The temperature, 41·15, was (41·15–35·97) 5·18° above the mean of the previous ten years.

North Shields.—A solar halo was seen on the 30th, and lunar halos on the 24th, 25th, 26th, and 30th.

An unusually mild month.

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Seaham Harbour.—Barometer varied from 26·60 on the 1st, to 30·42 on the 24th. Dull, cold, and wet weather at the beginning of the month. Fine and mild from about the 18th for ten days. Snow with squally and very high winds on the 29th. Barometer fell about an inch on the five preceding days.

February.—Otterburn.—Snow fell on the last three days of the month.

Allenheads.—Lightning was seen on the 4th and 10th.

Bywell.—Lightning was seen on the 4th and 7th. Auroræ were seen on the 7th.

Wylam.—Another changeable fickle month—one day fine, the next coarse. The barometer fluctuating but not very violently, and gradually tending upwards from the beginning to the 22nd.

The temperature was 39·23 (39·23–38·10), 1·13° above the mean height.

Vegetation forward. Apricot on cold wall in blossom on the 25th.

North Shields.—Lightning was seen, but thunder was not heard, on the 3rd and 7th. Lunar halos were seen on the 1st, 25th, and 27th. Auroræ were seen on the 7th, 12th, and 13th.

Seaham Harbour.—Barometer fluctuating. Weather very squally on first ten days. Thunder storm on the 4th. Heavy gale on the night of the 27th. Maximum height of barometer 30·37 on the 1st. Minimum height of barometer 28·90 on the 11th.

The great gale of the 11th, which was so severely felt on the southern coast of England, did not reach the northern counties at all. The Board of Trade reported that "the gales of Saturday night the 10th, and Sunday the 11th, were of unusual violence, and appear to have been most severely felt on our southern coasts. The disturbance seems to have partaken in some degree of a cyclonic character. It seems probable that the area of least pressure, or centre of the storm, passed in an easterly direction, not very far to the northward of London."

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The path of the storm seems to have been somewhat similar to that of "the Royal Charter storm," with less N. in its direction, and rather to the S. of that celebrated track.

March.—Bywell.—The farmers were not able to get the land prepared for sowing until the last few fine days in March.

Wylam.—Cold, variable, ungenial. Barometer showed two or three great fluctuations. There was a sudden fall from 29·480 on the 23rd, to 28·581 on the 24th, from which it rose on the 25th to 92·634, and was accompanied by a severe gale on the south coast.

Temperature 38·82, which is 2·14° below the mean.

North Shields.—Lunar halo on the 23rd.

Seaham Harbour.—Cold month, much frost, and snow showers up to the 24th. The south wind with milder weather prevailed up to the end of the month. On the 22nd and 23rd barometer fell an inch in thirty-six hours. The lowest point reached was 28·80. It rose again to 30·02 on the morning of the 26th.

Darlington, South End.—On the 20th the thermometer fell to 12° Fahrenheit.

April.—Otterburn.—The thermometer fell to 24° Fahrenheit on the 29th.

Bywell.—Thunder was heard and lightning seen on the 27th. The temperature of the month of April was very variable. The severe frost on the night of the 29th did some harm to the blossom of fruit trees. Grass was looking well, but fine genial weather was much wanted.

Wylam.—A great deal of east wind. Barometer pretty steady, and tending generally upward from beginning to latter end of the month.

Temperature 44·86 (44·86–45·69), which is 0·83° below the mean.

North Shields.—Hail on the 1st, 14th, and 29th. Snow on the 1st, 2nd, 3rd, and 30th. Lunar halo on the 21st and 22nd.

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Seaham Harbour.—Strong gales from N.E., accompanied by rain, characterized the beginning of the month. There was a gale on the 16th from S.S.W. The third week was mild and rather foggy. Thunder was heard and lightning seen on the 27th. There were some slight snow showers on the 29th. Average height of barometer 29·84, range 1·10.

May.—Otterburn.—The 1st of May was remarkable here for frequent snow storms throughout the day. On four days only in this month the temperature reached 60°. On three days it fell as low as 32°; and on seven days only it was not below 40°. The month of May, 1865, was 10° warmer. There were as many days in May 1865 when the temperature was above 70°, as in 1866 when it was above 60°. In 1865 the temperature only fell once below 40°.

Bywell.—During the month of May there was a great range of temperature, very severe frosts occurring at night, and great heat during the day, especially from the 19th to the 27th. The last few days were cold. The different grain plants looked well, but grass did not make much progress during the month. Early potatoes suffered by the frost; also berry-bearing fruit bushes. Apple blossom was plentiful. Vegetation generally was very backward for the season, and rain was much required.

Wylam.—Fine cold month, with a good deal of east wind. Barometer steady, rising a little in the middle of the month, and falling again towards the end.

Temperature 47·64 (47·64–51·62), 3·98° below the mean.

North Shields.—A solar halo was seen on the 31st.

Seaham Harbour.—The month began with very cold weather, and N.N.E. winds. The mean reading of the thermometer for the 1st and 2nd was 36·5°. Heavy showers of snow. Fine from the 3rd, with light and variable winds. On the 9th and 10th strong N.W. winds. Last two weeks very fine, with little variation in barometer.

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June.—Allenheads.—Thunder was heard on the 10th and 29th.

Bywell.—Thunder was heard on the 6th, 19th, and 29th. At the end of this month hay-making was in full operation: quality good but below the average in quantity. Wheat, barley, and oats were very promising. Peas and beans also looked well, but rain was much required for turnips and other green crops.

Wylam.—Fine cool month; but warm and fine towards the end.

Temperature 57·07 (57·07–57·00), 0·07° above the mean.

Seaham Harbour.—In the early part of the month the weather was very dull, with northerly winds. Afterwards it was fine with light winds. Heavy thunder shower on the 30th.

July.—Otterburn.—On July 13th there was a very violent thunder storm which lasted three hours. Much damage was done on both sides the Border hills. Many sheep were killed. Mr. Wearing estimates the number which perished as at least one hundred.

Allenheads.—Thunder shower on the 13th. Thunder was heard but lightning was not seen, on the 6th.

Wylam.—Fine month; barometer very steady. The warmest day this year was the 12th, when the thermometer rose to 86°; the following day to 84°.

On the 31st there was a flood in the Tyne (seven feet at Wylam Bridge), which brought up a great deal of salmon.

Temperature of the month 58·7 (58·7–58·91), 0·21° below the mean.

North Shields.—Thunder storm on the 13th. Fine month till the 28th. On the evening of that day rain began to fall heavily. It continued through the 29th. The morning of the 30th was fine, but at five o'clock it began to rain: during the night 1·46 inches was measured. Wind N.E., and a heavy storm.

Seaham Harbour.—Very fine month on the whole. Barometer

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rose from July 2nd to July 11th, when it reached 30·29 inches. It remained very steady until the 27th, when it fell 0·70 inches, and two or three wet days followed. Heavy gale from N.N.W. on the 31st.

August.—Allenheads.—Thunder storms on the 10th and 26th. Thunder was heard, but lightning was not seen, on the 28th.

Whitfield.—On the 29th 1·35 inches of rain fell, being the greatest amount registered on any one day during the year.

Bywell.—Thunder storms on the 10th and 26th. Thunder was heard, but lightning was not seen, on the 25th.

Wylam.—A dull cold ungenial month. In consequence of the flood on the 31st ult., there was a great take of salmon in the Tyne on the 1st and 2nd inst.

At Ryton Island, from the 1st to the 2nd, 862 salmon, 687 grilse, 625 salmon trout were captured, and all the other fisheries on the Tyne were in proportion.

Not a single humming-bird hawk-moth has been seen this year, though they have been looked for constantly in the verbena bed which they were so fond of last year.

Temperature 57·51 (57·51–58·87), 1·36° below the mean.

North Shields.—Cloudy damp month. Heavy rain on the 29th. Lunar halo on the 27th and 28th.

Seaham Harbour.—Showery and windy weather at the beginning of the month. Barometer ranging from 29·02 on the 7th to 30·40 on the 11th, falling again in twenty-four hours to 29·71. On the 16th heavy showers of snow and hail. Fine to the 28th. Much rain on the 29th.

September.—Allenheads.—Lightning was seen, but thunder was not heard, on the 1st.

Whitfield.—On the 6th 1·10 inches of rain fell in six hours, from six P.M. to midnight. The wind had been west in the

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morning, but backed to S.E. in the evening with a rising barometer.

Wylam.—Another dull cold ungenial month; damp, and with little sunshine. The corn very backward; much of it sprouted. Rain fell on twenty-four days.

The barometer during the whole month was below the mean height (29·970 inches), the height for the month being only 29·436; but its general tendency was upwards, and on the 30th it reached the mean point.

Temperature 53·32 (53·82–54·60), 1·28° below the mean.

North Shields.—Thunder on the 2nd, extremely cloudy and damp, with very little sunshine. Thunder was heard, but lightning was not seen, on the 18th.

Seaham Harbour.—Much fluctuation in the readings of the barometer. Strong gale and rain on the 20th. Several squally and wet days. Average mean temperature 52°.

October.—Wylam.—A fine month, with some dull cool weather towards the end. Barometer remarkably steady; fluctuating slightly above and below the mean line.

Temperature 50·27 (50·27–48·20), 2·07° above the mean.

Seaham Harbour.—Very foggy first few days, with occasional showers. On the 17th and 18th there was a strong gale from S.S.E., with rain and much sea disturbance. A gale on the 30th. Much rain fell during this month. Average mean temperature 49·75. Barometer steady at the beginning of the month, but fell towards the end.

November.—Allenheads.—The aurora borealis was seen on the 9th, 11th, and 19th. Snow fell on the 13th, 14th, 18th, and 24th.

Bywell.—The aurora borealis was seen on the 29th.

Wylam.—A fine month, with a constantly fluctuating barometer, though not to a great extent. The diagram of its

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movements are like the teeth of a saw, and almost as regular. No indications of Birt's November atmospheric wave.

Grouse have been very abundant and good this year. They have been selling generally at 3/6 to 4/ a brace; partridges at 3/; pheasants at 6/ to 7/ a brace; and hares at 3/ each.

The temperature of the month was 42·43 which is (42·43–41·02) 1·41° above the mean.

North Shields.—The aurora borealis was seen on the 11th. Lightning was seen, but thunder was not heard, on the 13th. The rainfall on the 15th, 16th, and 17th, amounted to 1·12 inches. The fall for the whole month was only 2·23 inches, being nearly half an inch below the average. Lunar halos were seen on the 17th and 22nd.

Seaham Harbour.—Strong winds from the 5th to the 15th. Frosty. Snow on the 17th. Much fluctuation in the readings of the barometer about the middle of the month. Wind N.N.W. on the 14th, when the great shower of meteors was seen.

The following account of the grand display of meteors on the 14th, is from the pen of the Rev. Canon Chevalier, of Durham:—

"At the Durham Observatory, good watch was kept for the expected meteors on the early mornings of November 13th and 14th. On the 13th a few falling stars were seen, but there was nothing remarkable either in their number or in their appearance; and about two hours after midnight the weather became cloudy, and the observations ceased.

"On the following night, at a comparatively early hour, promise was given of the approaching shower of meteors. In the evening of November 13th, at 10·30, mean Greenwich time, a meteor was observed in the N.E. at a low elevation, passing nearly parallel to the horizon, and ending its course nearly at the N.W. point, leaving a visible train of light in its course. This was followed by several other "shooting stars," at intervals of some minutes; and on the morning of November 14th, soon after midnight, a continuous shower of meteors succeeded, all proceeding, as was expected, in a direction parallel to a line

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drawn from the earth to a known star in the constellation Leo. By the general law of perspective, this gave them the appearance of diverging, in the eastern sky, and of converging, in the western sky, towards a point as much below the western horizon, as the star itself was above the eastern horizon. The general aspect of each meteor was not unlike the flight of a rocket: the colours of each varied, but the greater number, when the head of the meteor vanished, as if *burnt out*, left a coloured train, often appearing of a green tinge (possibly from the contrast with the general red colour of the meteor itself), and extending to a distance of three or four degrees, that is, six or eight times the apparent width of the moon. These trains were proved to be real visible objects, and not the effect left upon the retina of the eye by the moving nucleus, by remaining for eight or ten seconds, and sometimes longer, and also *by being plainly discernible by an eye which had not seen the nucleus itself*. One of these trains was observed to bend from the ordinary rectilinear form, and to turn itself, like a wreath of smoke, approximately into an elliptical form.

"Many of these "falling stars" were extremely small, like thin elongated pencils of light; others had a nucleus fully equal to the disk of the planet Mars, and even more brilliant; and the effect of these chasing one another through the bright starry sky, shifting and changing their form continually, was such as can never be forgotten by those who witnessed it. To the eye, many of these meteors appeared to be very near the earth, but their actual height was, no doubt, in all instances many miles, perhaps thirty or fifty, or even more, and cannot be accurately ascertained, for to do this it is necessary that the same meteor should be observed simultaneously by two persons, at known distant stations, which is obviously impossible, owing to the difficulty of identification.

"To an observer who turned himself towards the west, the appearance of the meteors presented a considerably different effect. They all seemed to *descend* towards the western horizon, and thus to assume the form of a *shower* of stars, as has been often described.

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"At about half-past one, the number of the meteors had sensibly diminished; and by two o'clock was reduced to comparatively few.

"Several flashes of lightning were seen in the course of the night; and a slight appearance of aurora borealis was perceived in the north.

"A bright clear sky, during the whole of a November night, the absence of the moon, and the position of our own part of the earth, with reference to this group of meteors circulating round the sun, have presented a combination of circumstances very favourable for the present observations."

These very grand meteoric showers recur regularly every thirty third year. There are, most probably, a number of concentric rings of these meteoric bodies circulating about the sun. The earth in its annual course around the sun cuts through these rings on certain days of the year, that is, in certain points of its orbit, and this explains the annual recurrence of showers on certain days. "The majority of these rings," remarks Mr. Carpenter, of Greenwich Observatory, "of which there must be a goodly number, have their meteoric particles evenly distributed throughout their circuit; but the November ring is not of such equable density, for its compound particles and masses are very thickly clustered in one part and scantily dispersed over the remainder.....The size of this November ring is slightly less than the orbit of the earth, revolving round the sun in a period of three hundred and fifty-four days, or eleven days less than that of the earth's period. The direction of its motion is opposite to that of the earth, and the orbit is inclined to the earth's orbit by an angle of about seventeen degrees. The portion of the ring which constitutes the thick cloud of bodies is about one-fifteenth of its circumference, or in linear measure about forty millions of miles, while the breadth of this cloud is about one hundred thousand miles. We dash into the midst of this cloud at the rate of eighteen miles a second, and its members fly on all sides around us with a flight of the same speed."

At Greenwich Observatory, where every possible care was taken to ensure extreme accuracy, an account was kept of the

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number seen. From nine to eleven o'clock only twenty-five meteors were noted: not more than would be seen on any ordinary November night. But when, at about the latter hour, the constellation Leo came above the horizon, it was evident that a "celestial sight of no ordinary character was to be expected. First at the rate of about one a minute, afterwards at the rate of about four or five, the fiery shafts silently flew in all directions from their common point of departure. Between eleven and twelve o'clock one hundred and sixty-eight meteors appeared. The average number of meteors up to midnight did not exceed three a minute. By half-past twelve this average rose to seventy, or more than one a second. Then there was a lull for a few minutes, and after that the numbers steadily increased, till the average stood at one hundred and eighteen. Then clouds came on and threatened to put an end to the scene; but they cleared off after a few minutes, and at about a quarter past one the maximum of the shower was reached; the average at that time being one hundred and twenty-two meteors per minute. From this time the numbers rapidly declined, till, after a few spurts of greater numbers, this average fell to seventy a minute at half-past one, fifty a minute at a quarter to two, and twenty a minute at two o'clock. At half-past two again a slight spurt increased the average for a minute or two, and at three o'clock it stood at ten. Still it decreased until between four and five A.M., when only forty meteors in all were counted. The whole number registered at Greenwich throughout the entire display amounted to eight thousand four hundred and eighty-five. Allowing for cloudy moments we may say, that the total number of meteors passing over the sky at Greenwich, from nine P.M. on the 13th, to five A.M. on the 14th, was about ten thousand."

It may be as well to add that some very eminent authorities state, that we may expect the real maximum of the thirty-three year period in the November of this year 1867.

The Rev. R. E. Hooppell, M.A., of the Marine School, South Shields, has furnished to the Club the following additional remarks on this subject:—

Immediately after the great shower of meteors a remarkable

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fall in the temperature took place. At Burghfield Grange the average daily maximum, for the seven days immediately preceding, had been 51½°, and the average daily minimum 36°. For the seven days immediately succeeding the shower, the average daily maximum was only 44°, and the average daily minimum 31°. For the next seven days the average daily maximum and minimum rose again, being respectively 47° and 39½°. This remarkable diminution was very extensively observed. The Astronomer Royal's report, from the Cape of Good Hope, shows that it occurred there also, which is the more noticeable, as the season was there approaching summer, and the temperature would be naturally increasing, not diminishing, from day to day.

December.—Allenheads.—Snow fell on the 1st, 2nd, 6th, 14th, 29th, 30th, and 31st. The aurora borealis was seen on the 25th.

Bywell.—The aurora was visible on the 25th. Snow was recorded on the 30th and 31st.

Wylam.—Fine changeable month; frequent short bursts of wind, but not much of it. Snow fell for the first time this winter on the 30th. Barometer made a very sudden fall on the 7th, when it was windy and cloudy here, but not so violent as such a fall would portend. Again it fell rapidly from 30·378 on the 22nd, to 28·948 on the 30th, which was followed by the violent snow storm with which the new year (1867) commenced.

Temperature 41·96 (41·96–39·93), 2·03° above the mean.

North Shields.—Snow fell on the 2nd, 30th, and 31st.

Seaham Harbour.—Windy. Fine during the middle of the month. Barometer very variable. Average height 29·70. Stormy on the 30th and 31st, when there was very keen frost, and a heavy fall of snow. Minimum temperature, 19°.

Darlington, South End.—During the year 1866 the temperature rose above 60° on one hundred and sixty-five days, and on one hundred and eight days it fell below 35°.

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RAINFALL RETURNS.

The returns furnished to the Club show that the rainfall during 1866, in nearly every part of the Counties of Durham and Northumberland, was considerably in excess of the average quantity as shown by the returns from each place in possession of the Club.

	INCHES.
At Dinsdale, near Darlington, the excess was	3·38
South End Gardens, Darlington	11·12
Whorlton	2·72
St John's	4·00
Ushaw	0·77
Hendon Hill, Sunderland	2·24
Seaham Hall	2·50
Howick	6·37
Cresswell	3·32
Whitley	1·03
Milfield, near Wooler	1·76
Glanton Pike	4·01
Lilburn	1·55
Brinckburn	2·62

IN THE TYNE VALLEY DISTRICT.

The fall of rain at every station up to and including Newcastle, was considerably above the average.

	INCHES.
At Stamfordham, the excess was	1·86
Park End	8·16
Allenheads	9·26
Bywell	0·84
Wylam	3·26
Newcastle Lit. and Phil.	2·22

At Gateshead, on the other hand, it was 1·56 inches below the average of three years; at Wallsend 0·34 inch below the average of eight years; and at North Shields 0·60 inch below the average of seven years.

Mr. G. Clayton Atkinson has again kindly furnished the Club with a return of the depth of the Tyne at Wylam Bridge, as ascertained from the Tynometer placed there by him in 1861.

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NORTHERN DISTRIC

...for ...ittle ...m. ...Co.'s ...age, ...feet ...y of Tyne. ...foo	*Millfield, nr. Wooler.	Glanton Pike.	Lilburn.	
	200 feet.	534 feet.	120 feet.	
	4 in.	7 in.	6 feet.	
...an. ...tan.	Quan.	Quan.	Quan.	
...hes. ...hes.	Inches.	Inches.	Inches.	I
·28 89	2·70	3·15	2·46	
·40 02	3·71	3·45	3·08	
·33 51	3·35	3·72	3.66	
·59 14	1·54	2·79	1·99	
·04 87	1·05	1·05	1·01	
·71 89	1·22	1·20	0·87	
·77 90	6·06	5·72	5·26	
·50 10	3·56	3·46	3·35	
·17 53	2·62	3·62	2·10	
·32 10	1·00	1·37	1·21	
·96 91	3·16	2.42	3·09	
·02 59	2·21	3·11	1·94	
·09 45	32·18	35·06	30·02	33
·41 ..	28·65	34·26	30·39	32
·93 ..	....	28·69	31·97	29
·60 ..	....	30·09	25·86	..
·00 ..	....	27·12	30·04	..
·22 ..	....	....	26·17	..
·26 ..	....	....	....	..
·85 ..	....	....	25·98	..
·19 ..	....	....	24·27	..
·86 ..	....	....	27·11	..
·06 ..	....	....	32·90	..
·22 Yr	30·42 (2 Yrs.)	31·05 (5 Yrs.	28·47 (10 Yrs.)	31 (3

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The following are the average depths for each month in the year:—

	Depth of Tyne at Wylam Bridge. Feet.
January	4·80
February	3·60
March	3·36
April	3·14
May	1·67
June	1·38
July	1·65
August	3·00
September	3·94
October	4·14
November	3·87
December	3·62
Mean	3·18

This is considerably in excess (3·18–2·46 = 0·72) of the average depth for 1864 (the only year for which I have a return), as might be expected from the fact of the rainfall in the upper part of the Tyne being so much above the average.

The closing days of July and August were marked by excessive storms nearly everywhere. On July 30–31, 2 inches of rain fell in twenty-four hours at Brinckburn; 1·61 inches at North Sunderland; 2·45 inches at Hendon Hill; 1·90 inches at Seaham Hall; 1·96 inches at Howick; 1·55 inches at Whitley; 1·46 inches at North Shields; 1·36 inches at Gateshead; 1·37 inches at Ushaw; 1·39 inches at St. John's; 1·25 inches at Dinsdale.

On August the 29th and 30th, 1·40 inches were recorded at Whitley; 0·66 inches at North Sunderland; 1·44 inches at Hendon Hill; 1·47 inches at Seaham Hall; 1·39 inches at North Shields; 1·21 inches at the Literary and Philosophical Institution in Newcastle; 1·27 inches at Gateshead; 1·30 inches at Ushaw; 1·35 inches at St. John's; and 1·25 inches at Dinsdale.

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The leading features of the rainfall throughout the British Islands, in 1866, are thus summed up by Mr. Symons:—

1.—(*a*) In every part of England the total fall was above the average.

(*b*) The excess in England averaged nineteen per cent. (say one-fifth), but it was irregularly distributed, the only approach to a broad general rule being that the greatest excesses were mostly on a tract running N.W. from Northampton to Alston in Cumberland. At some stations in this tract the excess was more than 40 per cent.

(*c*) In Scotland there were many stations which had less than their average; but those in the West Midland Counties having a considerable excess, the result for the whole country is a trifling excess of about 4 per cent.

(*d*) In Ireland the fall was below the average in the East, above it in the West.

2. (*a*) Comparing 1866 with the wettest year since 1847, we find that there were only three stations (Bolton, Belmont, and Preston, all in Lancashire,) in England at which the fall was greatest in 1866, and that, though a wet year, it has not been nearly so rainy as 1848 and 1852.

(*b*) In Scotland the year of previous heaviest rain is very irregular, but there also we find only one station wetter in 1866 than in any previous year.

3. The final results may be summed up in the verdict, that 1866 was a wet year, but not so wet as 1860, or 1852, or 1848.

Attention has been drawn to the effects of rainfall on the harvest, and the result is thus stated:—In 1859 the rainfall in a given district was 24·30 inches: the harvest was good.

In 1860, 34·46 inches fell: the harvest was bad.

In 1861, 24·47 inches fell: the harvest was favourable.

In 1862, 26·29 inches fell: the harvest was not good.

In 1863, 27·84 inches fell: but the summer was dry, and a good harvest followed.

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In 1864, 27·85 inches fell: but a dry summer again produced a good harvest.

In 1865, 33·33 inches fell: and the harvest was bad.

In 1866 the wet season produced the same result.

It would be interesting and valuable to trace out the connection between the harvest and the winter and summer falls of rain respectively. A wet winter followed by a dry summer would seem to be favourable to harvest prospects.

BAROMETER.

Some returns of the average readings of the barometer are given this year for the first time. Additional help in this part of the Meteorological Report has been promised for future occasions.

The few returns given, so far as they go, tend to render the Report more complete.

	BYWELL.	NORTH SHIELDS.	ALLEN-HEADS.	DURHAM.
January.....	29·509	29·563	28·152	29·295
February	29·445	29·469	28·070	29·229
March	29·550	29·591	28·181	29·326
April	29·817	29·875	28·488	29·578
May	29·863	29·931	28·488	29·637
June	29·789	29·835	28·439	29·556
July	29·801	29·827	28·451	29·569
August	29·589	29·643	28·256	29·363
September.....	.....	29·526	28·143	29·259
October	29·958	30·020	28·596	29·732
November	29·660	29·720	28·327	29·442
December	29·628	29·695	28·266	29·385

TEMPERATURE.

The returns of recorded observations are rather more numerous than usual this year; but as the temperature of the air may be said to be the turning point of all atmospheric phenomena, these records are most important. It is hoped that next year the Club will be furnished with many more returns than have ever yet been received.

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THERMOMETER.

	ALLENHEADS.			BYWELL.			WYLAM.			NORTH SHIELDS.			SEAHAM HALL.			DURHAM.		
	Max.	Min.	Mean.	Max.	Min.	Mean.	Max.	Min.	Mean.	Max.	Min.	Mean.	Max.	Min.	Mean.	Max.	Min.	Mean.
Jan. .	41·2	32·0	36·6	48·0	35·6	41·8	46·9	35·4	41·1	45·2	35·8	40·5	42·6	33·5	37·0	45·9	35·4	40·4
Feb. ..	39·6	29·8	34·7	46·3	32·9	39·6	45·7	32·9	39·3	42·9	33·6	38·2	45·2	32·2	38·7	44·0	33·0	38·2
Mar. ..	40·3	28·2	34·2	47·2	32·2	39·7	45·4	32·4	38·9	43·3	33·3	38·3	45·1	33·9	40·5	45·3	31·3	38·0
April ..	48·2	34·7	41·4	54·8	38·0	46·4	52·2	37·7	44·9	48·3	39·0	43·6	52·5	37·3	44·9	51·8	36·6	43·7
May ..	54·3	36·3	45·3	62·3	39·0	50·6	57·8	37·6	47·6	54·3	40·6	47·4	59·3	38·2	48·7	58·2	37·7	48·0
June ..	63·2	46·9	55·0	67·4	50·4	58·9	66·2	47·9	57·0	62·3	49·4	55·8	65·2	47·4	56·8	67·1	47·8	56·7
July ..	63·3	48·6	55·9	71·1	53·0	62·1	67·2	50·2	58·7	62·8	53·3	58·0	65·1	49·5	57·3	67·2	49·9	57·4
Aug. .	60·7	47·3	54·0	66·1	51·0	58·5	65·0	50·1	57·5	61·0	50·5	55·7	63·2	49·2	56·2	64·6	49·5	56·6
Sept. ..	56·0	43·0	49·5	....	....	....	60·6	46·0	53·3	57·1	47·5	52·3	59·2	46·2	52·7	59·5	46·3	52·6
Oct. ..	52·8	41·2	47·0	58·0	43·3	51·1	56·6	43·9	50·2	53·2	46·4	49·8	55·2	44·2	49·7	54·4	45·2	49·8
Nov. ..	44·7	33·3	35·9	51·3	36·3	43·8	49·4	35·5	42·4	47·3	37·4	42·3	49·9	34·4	41·6	47·9	37·3	42·4
Dec. ..	43·5	33·3	38·4	49·4	35·9	42·6	48·7	35·4	42·0	44·4	36·7	40·1	47·3	32·2	39·7	45·8	36·2	40·9
Mean ..	50·7	37·7	44·2				55·2	40·4	47·8	51·8	41·8	46·8	53·3	39·4	46·3	54·3	40·5	47·4

The following diagram, showing the average temperature for ten years at Wylam, and twelve years at Sheffield and Birmingham,

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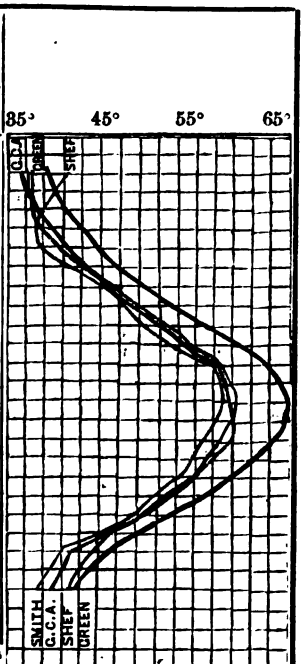
and for fifty years at Greenwich, is of peculiar interest, indicating as it does, at a glance, the range of the thermometer for so considerable a period in the North, the Midland District, and the South of England.

The Club is indebted to its old and tried friend, Mr. George Clayton Atkinson, of Wylam Hall, for the labour of preparing this diagram and table.

	G. C. A.'s Monthly Means for 10 Years, 1856 to 1865 both inclusive.	Smith's Means for 12 Years, 1853 to 1864 at Birmingham.	Broomhall Park, Sheffield.	Greenwich Means from 1814 to 1863. B.M.S.Trs. Vol. II, p. 344.
Jan.	35·97	37·60	41·2	36·9
Feb.	33·10	37·10	38·9	38·7
Mar.	40·96	40·50	38·7	41·7
April	45·69	45·20	45·9	46·2
May	51·62	50·40	48·3	52·9
June	57·00	56·30	56·9	59·1
July	58·91	59·00	57·5	61·8
Aug.	58·87	58·80	55·6	61·2
Sept.	54·60	54·90	53·1	56·6
Oct.	48·20	49·60	48·9	50·2
Nov.	41·02	40·80	43·7	43·2
Dec.	39·93	58·70	41·7	39·8
Mean	47·60	47·60	47·5	49·03

	G. C. A.'s Annual Means.	Smith's Annual Means.
1856	47·44	48·90
1857	49·16	51·10
1858	47·71	47·70
1859	47·14	48·50
1860	44·90	45·70
1861	47·94	48·40
1862	47·42	48·20
1863	49·36	49·00
1864	46·77	47·20
1865	48·14	
Mean	47·59	48·30



The diagram for Greenwich is made two divisions higher, to avoid confusion.

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The subjoined tables, showing the average temperature of the air at different parallels of latitude during the year 1866, may prove of somewhat general interest, as they illustrate the often discussed question of the comparative climates of the different parts of England.

MEAN TEMPERATURES, 1866.

	January, February, March.	April, May, June.	July, August, September.	October, November, December.
	Degrees.	Degrees.	Degrees.	Degrees.
1. Guernsey	44·4	51·2	57·6	50·4
2. Devon and Cornwall	44·0	51·6	58·3	50·6
3. Isle of Wight	43·5	53·9	60·2	48·5
4. Between latitude 51 and 52 deg. (say Dover to Harwich)	41·5	52·7	58·0	46·5
5. Between latitude 52 and 53 deg. (say Harwich to Boston)	40·8	52·1	57·2	46·2
6. Between latitude 53 and 54 deg. (say Boston to York)..	40·0	51·4	55·1	45·2
7. Between latitude 54 and 55 deg. (say York to Newcastle)	38·8	49·1	54·8	44·7
8. North Shields	38·6	46·9	53·9	44·7

Comparative table of the mean average monthly temperature of the air during 1866 at the following stations on the eastern side of England:—

	Jan.	Feb.	March.	April.	May.	June.
Isle of Wight, Ventnor	46·0	44·2	43·0	50·6	52·5	61·3
London, Greenwich	42·6	40·5	40·5	47·9	50·1	60·9
Grantham	42·0	40·1	39·6	46·8	48·6	56·9
York	41·2	39·0	38·4	44·8	48·5	56·9
Durham.....	40·4	38·2	38·0	43·7	48·0	56·7
North Shields	40·6	38·0	37·1	41·6	45·7	53·5
	July.	**Aug.**	**Sept.**	**Oct.**	**Nov.**	**Dec.**
Isle of Wight, Ventnor . ..	62·8	61·4	58·5	53·5	47·0	45·0*
London, Greenwich	61·0	59·4	56·4	51·3	44·8	42·9
Grantham	58·3	57·3	54·9	51·0	43·5	42·6
York	58·7	56·7	53·7	50·8	42·9	41·6
Durham.....	57·4	56·6	52·6	49·3	42·4	40·9
North Shields	55·9	53·6	51·0	48·8	42·1	41·1

Average for the year:—

Ventnor.....	52·3	Grantham..	48·4	Durham	47·0
London, Greenwich	49·9	York	47·8	North Shields	45·9

* No returns from Ventnor being available for October, November, and December, the temperature of Osborne has been taken instead.

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Mean readings of maximum and minimum temperatures during the winter months of January, November, and December, 1866, at the following places:—

	Mean of all the highest.	Mean of all the lowest.	Mean of both.
London, Greenwich	48·7	38·0	43·3
York	46·8	36·9	41·8
North Shields	45·7	36·7	41·4

Highest readings of thermometer in 1866 during the three winter months:—

	January.	November.	December.
London, Greenwich	54·3	59·6	56·3
York	54·5	59·5	53·0
North Shields	53·6	57·2	54·8

Lowest readings of the thermometer in 1866 during the three winter months:—

	January.	November.	December.
London, Greenwich	23·7	26·5	27·7
York	21·0	27·0	27·0
North Shields	24·0	28·4	27·5

The temperature at North Shields, it will be seen, was never quite so high during these three winter months as at Greenwich; and on the other hand, it never fell so low but once, in December, as the lowest recorded temperature at Greenwich.

Mean readings of maximum and minimum temperatures during the spring months of February, March, and April, 1866, at the following places:—

	Mean of all the highest.	Mean of all the lowest.	Mean of both.
London, Greenwich	51·2	36·6	43·9
York	47·6	35·6	41·6
North Shields	44·5	35·3	39·9

Mean readings of maximum and minimum temperatures during the summer months of June, July, and August, 1866, at the following places:—

	Mean of all the highest.	Mean of all the lowest.	Mean of both.
London, Greenwich	71·8	52·3	62·0
York	69·9	52·6	61·2
North Shields	62·8	50·7	56·8

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WIND.

The returns which have been furnished to the Club, of the direction of the wind, are again exceedingly scanty. So easy and simple a matter as making a daily note of its direction ought not to present much difficulty to many members of the Tyneside Club.

The observations most needed are those taken from wind vanes placed in elevated situations, and as far as possible out of the influence of merely local currents.

A comparison of the few returns obtained by the Club in this and previous years, with the following deductions obtained by Mr. Glaisher, from twenty years recorded observations at Greenwich Observatory, will be interesting.

According to Mr. Glaisher's observations:—

The north wind is least prevalent in December, and most prevalent in May.

The north-east wind is least prevalent in December, and most prevalent in May.

The east wind is least prevalent in January, and most prevalent in April.

The south-east wind is least prevalent in July, and most prevalent in March.

The south-west wind is least prevalent in April, and most prevalent in July and August.

The west wind is least prevalent in May and November, and most prevalent in October.

The north-west wind is least prevalent in May, and most prevalent in March.

Calm days are least frequent in April, and most frequent in September.

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APPROXIMATE RESULTANT DIRECTION AND DURATION OF WINDS IN 1866.

AM	WHITLEY.		GATESHEAD.		WYLAM.	
M	Equivalent Direction.	Equivalent Duration.	Equivalent Direction.	Equivalent Duration.	Equivalent Direction.	Equivalent Duration.
January	W.42°S.	14½	W.29°S.	13	W.18°S.	26
	W18½°N.	11	W.32°N.	10	W.1°S.	16
	N.12°W.	8	E.21°N.	4	W.21°S.	6
Februa	E.4°S.	12	N.34°E.	11	E.27°N.	10
	S.4°W.	5	E.38°N.	6¾	E.6°N.	7
March	W.36°S.	11½	E.34°N.	7¾	W.11°S.	8
	N.40°W.	13	N.19½°W	11½	N.29°W.	6
April	S.35°W.	6¾	S.19°E.	5	W.14°N.	9
	S.23°W.	15	S.5°E.	6	W.16°S.	18
May	W.30°S.	12	N.34°E.	7½	S.35°W.	4
	W.31°S.	10	W.13°N.	18½	W.1°N.	23
June	W.28°S.	12	S.40°W.	8½	W.2°S.	26
	W.29°S.	77	W.2°N.	18¼	W.4°S.	119

July

August

Septem

October

Novem

Decem

For wh

The day in

SEAHAM HALL.

MONTH.	PREVAILING WINDS.
January	West and South.
February	West and North-west.
March	West, North-east, and South.
April	North-east and West.
May	East, North-east, and North-west.
June	West and North.
July	West and North West.
August	South-west and East.
September	West and South-west.
October	South and South-east.
November	North-west and West.
December	South and South-west.
Whole Year	West.

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In every month the S.W. wind is a multiple of every other wind. In January, July, and August, this wind averages one-third of each of these months, and nearly one-third in October. In April its mean continuance is nearly a third of the month, and in all the remaining months its duration is something more or less than one-fourth.

The mean yearly continuance

Of the north wind is	40·70 days.
Of the north-east wind	47·60 days.
Of the east wind	22·55 days.
Of the south-east wind	19·90 days.
Of the south wind	34·20 days.
Of the south-west wind	104·00 days.
Of the west wind	38·30 days.
Of the north-west wind	24·10 days.
Of calm wind	33·70 days.

RAIN GUAGES.

Some persons having asked for information on the subject of rain guages, they may be glad to know that Mr. Symons, who is the great authority on all rainfall subjects, recommends a guage five inches in diameter, made by Apps, No. 433, Strand, London; Cassella, Hatton Garden, London; and Messrs. Negretti and Zambra, Hatton Garden, London. It consists of an external tin case with a funnel, and a holder inside the guage. The measuring glass is also inside the case. All that is necessary in order to record the rainfall is to measure the quantity collected in the holder by pouring it into the measuring glass, and then making a memorandum of the quantity so ascertained, whenever the rainfall amounts to 0·01 of an inch. The measurement should be made at nine A.M. A record should be kept of the number of wet days in each month, i.e., days on which 0·01 of an inch of rain falls. These guages are supplied at 10/6 each; and if obtained through Mr. G. J. Symons, of No. 136, Camden Road, London, will be supplied accurately tested, without additional charge.

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CLIMATOLOGICAL TABLES RELATIVE TO THE FLOWERING OF PLANTS.

More scanty than ever are the returns sent in this year for this department of our Meteorological Report. If the members of our Club would but endeavour to circulate the papers printed by the Club amongst gardeners, game-keepers, and others, whose occupations necessarily lead them to make observations on the matters embraced in this department of the Report, and to interest them in the work, there cannot be any doubt that a very valuable amount of accurate information would be obtained. It is to be hoped that efforts will be made this year to carry out this suggestion, and that in the course of two or three years a very considerable number of additional returns may be obtained from various parts of Northumberland and Durham.

(1) *Table showing dates of Flowering of Trees and Plants.*

FRUIT TREES, SHRUBS, AND PLANTS.	WHORLTON.	STAMFORDHAM.	SEAHAM.	WYLAM.	NORTH SHIELDS
	In Blossom.	In Blossom.	In Blossom.	In Blossom.	In Blossom.
Apple... (Stand'rd Trees only.)	May 19	.....	May 13	.....	.....
Cherry (Stand'rd Trees only.)	.....	.....	.....	.....	.....
Pear ... (Stand'rd Trees only.)	.....	.....	May 10	April 13	.....
Plum ... (Stand'rd Trees only.)	May 13	.....	.....	April 15	.....
Aconite	.....	Jan. 23	.....	.....	Feb. 4
Black Thorn	April 23	.....	.....	March 30	.....
Bramble	June 25	.....	.....	.....	.....
Broom	May 17	.....	.....	.....	.....
Currant, Black	May 8	.....	April 10	.....	.....
,, Red Flower	April 8	.....	April 6	March 28	.....
Elder	June 20	.....	July 2	.....	.....
Gooseberry	April 18	.....	April 18	.....	.....
Hawthorn	.....	.....	April 18	.....	.....
Hazel	June 12	.....	Feb. 10	.....	.....
Laburnum	June 6	.....	May 22	.....	.....
Lilac	June 3	.....	May 22	.....	.....
Mountain Ash	June 4	.....	June 7	.....	.....
Privet	Aug. 8	.....	.....	.....	.....
Rose.....	June 25	.....	June 20	.....	.....
Sallow	.....	.....	March 10	.....	.....
Whin or Furze	Mar. 1	.....	March 20	.....	.....
Anemone.....	Mar. 30	April 16	April 5	.....	.....
Blue-bell.....	April 20	.....	April 7	.....	.....
Celandine (lesser)...	.....	Feb. 18	.....	Mar. 30	.....
Coltsfoot	.....	Mar. 30	March 1	.....	.....
Cowslip	.....	April 16	.....	.....	.....
Dandelion	April 16	.....	.....	.....	.....
Dog Violet.....	.....	April 5	Feb. 26	.....	.....
Garlic	May 19	.....	May 10	.....	.....
Lily of the Valley...	May 30	.....	May 20	May 26	.....
Primrose.....	Mar. 23	Mar. 30	Feb. 6	.....	Mar. 24
Strawberry, Garden	May 13	.....	May 20	.....	.....
Snowdrop	Jan. 18	Jan. 25.	Feb. 29	Jan. 21	Jan. 21

Seaham.—Apples an abundant crop; cherries only an average

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crop; plums were scarce. There was a great abundance of both blackberries and elderberries. The leaves of the hazel have been much eaten by the caterpillar *Chiematobia brumata*.

Wylam.—On January 21st Gloire-de-Dijon rose fully out in blossom and quite fragrant. This was, of course, quite accidental. On February 25th the apricot trees on a cold wall were in blossom. On May 24th white thorn out. On May 26th Gloire-de-Dijon rose in flower; gooseberries gathered for the first time. On June 24th wild roses in hedges out in flower, and also the standard roses in the garden. On June 28th laurels in flower, and strawberries ripe.

North Shields.—Crocus in flower February 6th; hepatica, January 27th; auricula, March 31st; pansy in garden, January 17th; polyanthus, January 28th. Pears were ripe on September 14th; apples, September 28th. Barley first cut on August 17th; and wheat on August 27th.

Stamfordham.—Barley was cut on September 11th: oats sown April 16th were cut on October 31st.

(2) *Dates of Arrival and Departure of Birds.*

MIGRATORY BIRDS.	SEAHAM.		STAM-FORD'M.
	Arrival.	Departure.	Arrival.
Black-cap	June 27	.....	.....
Chiff-chaff	April 21	Sept. 27	May 19
Corncrake	.....	.....	May 12
Cuckoo	April 26	Aug. 4	May 8
Fieldfare	Oct. 17	Feb.	.....
Redwing	Oct. 20	Feb.	.....
Swift	May 9	Sept. 13	May 18
Swallow	May 7	Oct. 6	April 14
Wheatear	May	July.	.....
Whitethroat	April 30	Sept. 1	April 21
Willow Wren	April 17	Sept. 13	.....
Woodcock	Oct. 18	.....	.....

Seaham.—The Corncrake was not heard this season. No Redstarts were observed. The Whitethroat was very rare.

Stamfordham.—The Plover was heard on February the 27th. Larks were singing on March the 16th. The Curlew was observed on January the 28th. Wood-pigeons cooing on March the 22nd.

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Winston.—The Blackbirds were singing on January the 19th.

Wylam.—On January 26th Blackbirds and Thrushes singing vigorously. On March 28th Rooks had eggs. On April 21st Sand Martins came.

(3) *Table showing Dates of Budding, &c., of Forest Trees.*

FOREST TREES.	WHORLTON.			SEAHAM.		
	In Bud.	In Leaf.	Divested of Leaves.	In Bud.	In Leaf.	Divested of Leaves.
Alder	April 21	.....	.....	May 1	May 17	.....
Ash	May 16	May 9	Oct. 30	May 10	May 29	.....
Beech	May 24	May 10	Nov. 6	.....	May 19	.....
Birch	April 21	May 7	.....	.....	May 14	.....
Elm	April 25	May 22	.....	Feb. 5	May 17	Sept. 24
Larch	April 16	April 22	Oct. 28	April 16	May 18	.....
Oak	May 12	May 25	Nov. 3	.....	May 26	.....
Poplar	April 30	June 9	Nov. 12	Mar. 28 Sh. Catkin	May 15	.....
Sycamore	April 22	April 30	.....	April 17	May 5	.....

At Seaham the ash was in flower on May 8th, and the larch on April 5th.

(4) *Dates of First Observation of Insects.*

INSECTS.	SEAHAM.	STAMFORDHAM.
	First seen.	First seen.
Small White Butterfly	May.	March 20
Orange Tip ,,	.....	May 23
Tortoiseshell ,,	April 23	April 17
Hive Bees (swarmed)	June 23	Feb. 18
Humble Bees	April 19	Mar. 30
Wasps	May 7	April 21

Seaham.—No orange-tip butterflies were seen this summer. Humble bees were not numerous. Wasps were rarely seen.

The observations recorded in the Meteorological Report and Climatological Tables have this year been furnished by the following contributors:—

Allenheads and Bywell.... Mr. Matthew Varty, Haydon Bridge.

Howick Hall (Earl Grey) .....
Lilburn Tower (E. J. Collingwood, Esq.)
Roddam Hall (Wm. Roddam, Esq.).....
Glanton Pike (F. W. Collingwood, Esq.)..
} Communicated by the Rev. J. F. Bigge.

Brinckburn ..... C. H. Cadogan, Esq., Brinckburn Priory.

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Cresswell ..... H. Cresswell, Esq., Cresswell, Morpeth.
Darlington ..... Mr. John Richardson, South End.
Dinsdale Rectory, near Darlington.. Rev. J. W. Smith, M.A.
Durham..... ..... M. R. Dolman, Esq., Durham Observatory.
,, ... Rev. Dr. Gillow, Ushaw College.
Eaglescliffe, near Yarm .. Rev. J. Hull, M.A.
Gateshead..... George Wailes, Esq., Burghfield Grange.
Millfield, near Wooler .... G. A. Grey, Esq.
Newcastle..... Literary and Philosophical Society.
North Shields ..... Robert Spence, Esq.
Otterburn..... Rev. Timothy Wearing.
Park End ..... M. A. Ridley, Esq.
North Sunderland ..... Rev. F. R. Simpson, M.A.
Seaham .... Mr. R. Draper, Seaham Hall Gardens.
,, ... Mr. J. Kitts, Londonderry Office.
South Shields ..... Rev. R. E. Hooppell, M.A., Head Master of Marine School.
Stamfordham ..... Rev. J. F. Bigge, M.A.
Stanhope ..... H. Pease, Esq., Stanhope Castle.
Sunderland ..... J. W. Mounsey, Esq., Hendon Hill.
Wallsend ..... J. W. Dees, Esq.
Whitfield ..... Rev. J. M. Mason, M.A.
Whittle Dean Company's Reservoirs.... D. D. Main, Esq.
Whorlton, Teesdale ..... T. Dodgson, Esq., Stubb House.
Wolsingham..... W. Backhouse, Esq.
Wylam ..... G. C. Atkinson, Esq., Wylam Hall.

XXVII.—*List of a few Local Homoptera.* By Thomas John Bold.

(CONTINUED FROM PAGE 131.)

Since the publication of my former communication on Homopterous insects, a more careful search has shown, that even in the limited area examined, we have no inconsiderable number of other species. These I now venture to lay before the Club, hoping to add many more to the list when our more distant localities come to be examined.

36. *Delphax guttula*, Germ. Found rather plentifully. Occurring amongst rough herbage in August, at Gibside; and

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at the roots of grass on sand-hills near Hartley, in November and December. Winged, brachypterous, and larval forms all taken at the same time.

37. *D. hamatus*, Boh. A large well-marked species. Common in rough grassy places in our district. Most of the specimens are of the short-winged form, not one in a hundred having the wings fully developed.

38. *D. striatellus*, Fall. Somewhat rare. Has been taken in the macropterous form, at Briar Dene, Gosforth, Gibside, &c., in May, June, and August.

39. *D. forcipata*, Boh. I have two males from Hartley and Seaton, which are referred by the Rev. T. A. Marshall to this species. It is a small black-looking creature, and rather glossy. The only locality given by Flor is Sweden. Found in May and June.

40. *D. discolor*, Boh. This species is abundant with us in May and June, but none of the specimens taken are winged. It frequents grassy places, preferring short green herbage, such as obtains in closely cropped pastures. I have also taken it in hilly places in Cumberland.

41. *D. limbatus*, Fab. Exceedingly abundant amongst rushes in damp places, occurring most plentifully in September. Of the many hundreds swept up, not one with developed wings has been noticed.

42. *D. nasalis*, Boh. Two males and three females of this rare and well-marked species were taken at Gosforth, in July. Both were of the brachypterous type.

43. *D. albomarginatus*, Curtis. This very pretty thing is not rare with us. I have taken it amongst rough herbage at Briar Dene, Gosforth, and elsewhere, by sweeping herbage, in June. But I found it more plentifully by searching at the roots of the herbage on the sand hillocks near Hartley, in May. All taken are of the short-winged form.

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44. *Issus coleopteratus*, Fab. Larval form only taken. Beaten out of bushes at Gosforth, in May.

45. *Ulopa obtecta*, Fab. Roots of heath. Occurs not uncommonly at Gosforth, in September and October. It is a sluggish creature, and leaps as if its head was too heavy for its heels.

46. *Eupelix cuspidata*, Fab. Apparently rare. Amongst cut grass at Gosforth, in July. I found the larva in November, at the roots of herbage on the sea-banks, near Hartley.

47. *Idiocerus varius*, Germ. Males and females in plenty, on the willows by the Derwent side, near Axwell Park, in June.

48. *Pediopsis virescens*, Germ. Same locality as the preceding, but much more rarely. June.

49. *P. scutellatus*, Boh. Two males and two females, shaken out of recently cut grass at Heaton, in August. They were accompanied by a queer looking creature, which I take to be the larva, or pupa. It is ob-conical, yellow, maculated on head, body, and legs with brown; sparsely covered with hairs, which spring from little tubercles, and which are arranged in three rows on each side of the abdomen; the abdomen is triangular, compressed, each segment produced into a strong tooth above.

Both specimens were thickly covered by small black pellets, matted together with a thready substance, and which I am inclined to think was composed of their own excrement.

50. *Iassus socialis*, Flor. Exceedingly abundant in grassy places during August and September. I have captured it at Axwell, Gosforth, Little Benton, &c.

51. *I. abdominalis*, Fab. Of rare occurrence. I have examples from Axwell, Gosforth, and Seghill, taken in July and August.

52. *I. vitripennis*, Flor. A single specimen, taken near Whitley, in June.

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53. *I. pulicarius*, Fall. Abundant in a pasture field near Seghill, in August.

54. *I. striata*, Fall. Local. Abundant amongst the rough herbage, on the margin of the lake at Gosforth, in August and September.

55. *I. septem-notatus*, Fab. Rare. Four specimens only have been taken at Gosforth, in August.

56. *Aphrodes sabulicola*, Curt., Brit. Ent., Pl. DCXXXIII. Exceedingly abundant on the sandy "Bents" at South Shields, from June to September. They live at the roots of the sparse herbage, especially affecting the little thickets of *Rosa spinosissima*, and are exceedingly difficult to capture, being by far the best leapers known to me. Scores may be under the eye at one time, but the unaided hand will fail to take a single specimen. A sweeping net, worked against the breeze, produced good results, as their vaulting propensities assist materially in their capture.

57. *Eupteryx albostriatellus*, Fall. By no means rare among rough herbage, from July to October. I have taken it at Gibside, Gosforth, and in the dene west of Hartley.

58. *E. citrinellus*, Fall. Abundant on the sea-coast amongst grass, &c., from July to October.

59. *E. flavipennis*, Zett. Taken by sweeping the Equisetum, and other plants, growing on the bed of the lake, at Gosforth, in October.

60. *E. blandulus*, Rossi. Rare. Taken near Hartley in September.

61. *E. geometricus*, Sch. A well-marked species, which has occurred sparingly at Gosforth and elsewhere, in July and September.

62. *E. quercus*, Lin. Two or three specimens from Gosforth, which were taken in July.

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63. *E. signatipennis*, Boh. Rare. Gosforth in August, and Axwell in September.

64. *Eupteryx Strachydearum*, Hardy. On the wild sage near Axwell, in extreme abundance during September. Mr. Hardy found it on the same plant, and so late as December. It is a most active creature, and very difficult to secure, as it jumps out of the net and is away as soon as ever you attempt to bottle it.

NOTE.—Some few local species having occurred more abundantly, may deserve a passing notice.

Acocephalus bifasciatus, Linn.

This elegant little creature, hitherto very rare, has this year occurred in great abundance. I have found it at Gibside, Axwell, Heaton, Briar Dene, Hartley, and Gosforth. At the latter place, on the 2nd of July, I found both sexes quite in profusion, in an open place in the wood, where the soil was of a dry heathy nature. An occasional male might be seen mounting a culm of grass, but the females were always found at the very roots of the herbage, and are by no means such good leapers as their partners. The males were nearly all of the distinctly white banded type, very few indeed being of the dark variety figured by Curtis. The females vary from pale greyish-yellow to blackish-grey.

Acocephalus agrestis, Fall.

Exceedingly common, and variable, both in size and colouring. In a low-lying pasture field, close to the water's edge, near Holywell, I found swarms of a small variety: males not more than one line in length, and the females about one line and a half. Most of the males were so thickly marked with brown as to appear nearly black. On the margins of the lake at Gosforth nearly white examples occur, and some of them fully three lines long. In the rough herbage on the coast we have the same large pale insect, but the head has become more blotched with black. In the hedgerows, near Little Benton, we find a variety which

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really looks very like a distinct species. The vertex is slightly produced in front, the neuration of the wings is more distinct, and the colouring is pale rufous, which on the crown forms a ∧ shaped mark. In a field or two west of this place, in a swampy spot only a few yards square, I swept up a lot of large specimens (two and a half to three lines), every one of which, both males and females, is as dark in colour as the small males from Holywell.

Of the species of *Iassus*, *ocellaris* is by far the most abundant with us. Scarcely can a tuft of rough herbage be disturbed without meeting with it in plenty; *pascuellus* is also abundant, but more local; *subfuscata*, and *prasinus*, are also most abundant, occurring in woods; *quadrinotatus* abounds in wet meadows; *sexnotatus* is equally common in rough pastures; *striatus* is very common on the banks of the Derwent, near Axwell Park.

Of *Eupteryx*, *smargadulus* is very abundant amongst willows, &c., by the Derwent and elsewhere; *rosæ* abounds on roses in our garden at Long Benton, in July: a second brood appeared this year about the beginning of October, and continued to be seen in plenty up to the end of the month; *flavescens* and *pulchella* are also common enough; *vittata* occurs also frequently, but less common; *aurata* and *urtica* frequent beds of nettles, and are exceedingly abundant everywhere throughout the district.

XXVIII.—*Entomological Notes for the Year* 1866. By Thomas John Bold.

The past year (1866) has, in our district, been an unfavourable one for the collector of insects. On going over my notes I find that the peculiarity of the season lies in the nearly total absence of destructive species and their larvæ. With very few exceptions, our fields and gardens were exempt from the ravages of insect enemies. The larvæ of Lepidoptera, of Saw-flies, of Coleoptera, and of Diptera, were alike wanting, or in very reduced numbers;

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whilst our bean and turnip fields were quite free from those destructive pests, the Aphides.

This was, no doubt, the result of excessive moisture, which is always very destructive to insects, much more so than excessive cold. The previous winter was very open, with a large fall of rain. Spring, too, was very wet, cold, and protracted, whilst the summer was, I believe, much below the average temperature; and very heavy falls of rain took place towards its close, and in autumn.

Notwithstanding these unfavourable influences some additions have been made to our Fauna, principally in *Coleoptera*, *Hemiptera*, and *Homoptera*; but, as many of the first and last were taken in 1865, I have given them in separate forms. The re-occurrence of a few rare or local *Coleoptera* may however be here enumerated. *Lamprias chlorocephalus*, *Dyschirius thoracicus*, and *D. globosus*, have occurred on Whitley sands, the two latter abundantly. *Pristonychus terricola*, *Agonum marginatum*, *Platyderus ruficollis*, and *Curtonotus convexiusculus*, have all been found, in some plenty, near South Shields. *Tachys Fockii* has occurred in its old haunt, sparingly to myself in June; more plentifully to G. R. Crotch, Esq., whom I directed to the locality in July. *Aleochara bilineata* has been found near Whitley and South Shields, some of the specimens being curiously small. The banks of the Devil's water furnishes *Tachyusa contracta*, *T. rubicunda*, *T. leucopa*, and *Bledius subterraneus*; the latter in exceeding abundance. Two examples of the rare and beautiful *Boletobius cingulatus* were taken in Gosforth woods in September. *Coprophilus striatulus*, and *Homalium Allardi*, from the sands at Whitley. *Eusphalerum Primulæ* was found very abundantly in the flowers of the primrose at Gibside. *Rhizophagus cribratus* was taken at Hartford Bridge. *Rhiz. parallelocollis* has again been taken on burial ground fences. *Dasytes æratus* from Whitle Dene. *Cis festivus*, Hartley Dene. *Scaphidema metallicum* was taken on the banks of the Derwent, near Axwell. *Ischnomera melanura*, sands, near South Shields, where I also found *Trachyphlæus scabriculus*. A fine series of *Sitones Meliloti* was found on the melitot trefoil near Hartley. Considerable numbers of

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Hylurgus piniperda, and *Scolytus destructor*, were observed crawling on Whitley sands, close to the sea—a curious locality for bark-eating beetles: whence they came I could not determine. *Thyamis suturalis* was found sparingly at Gosforth and at Whitley. *Scymnus nigrinus* is from the north-end of Whitley sands. The beautiful *Strangalia-4-fasciatum*, and *Rhagium bifasciatum*, were found near Witton-le-Wear, by my friend Mr. Maling. Mr. Crotch found *Anthophagus alpinus* to be abundant on the top of Cheviot in July, and single specimens of the very rare *Lathrobium angusticolle*, and *Cryptohypnus maritimus*, at Yetholm.

For *Hymenoptera* the year 1866 has been, with us, one of the worst on record, no doubt the effect of the wet and cold previously mentioned. Even *ants*, generally so abundant, were scarce. I found a small colony of the rare *Myrmica denticorne* beneath a stone at Whitley, but it only contained ten workers: the closest search could not unearth the other sexes. The only *fossorial* insect seen in abundance was *Mellinus arvensis*, which, burrowing in dry sand, beneath the tangled sward, would appear to have escaped destruction. Of *Pompiles* two commoners only (*P. plumbeus* and *gibbus*) have been taken—both on the sea-coast. *Crabro clavipes* was the only one of this genus seen. I have not for some years seen any of the wood-boring species of *Crabro*, although constantly on the look for them. *Odynerus spinipes* has been noticed, but very sparingly. *Wasps* would appear to have been nearly totally wanting: not one male or female, and only three workers, did I see the whole season. *Bees* have for some years been very scarce with us, and still continue so, two species of *Halictus* (*rubicundus* and *cylindricus*), five of *Andrena* (*aneraria*, *albicans*, *Clarkella*, and two small ones), and a single female of *Megachile circumcincta*, forming the sum total of my captures. *Bombus lucorum* was the only one of the genus in any abundance. I also saw *muscorum*, *senilis*, *sylvarum*, *Scrimshiranus*, and *hortorum*, but only in numbers sufficient to show that they have not become extinct. Their parasites the *Apathi* were equally rare. One benefit came out this dearth of species—we had no Saw-flies. Our gooseberry bushes at Long Benton are generally defoliated by the larva of *Nematus dorsalis*, but this

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year the spoiler was absent, most likely drowned in the pupa state, which is passed in the ground.

Being anxious to get together a collection of *Hemiptera*,* I have searched closely for local species, but only with moderate success. *Scolopostethus adjunctus* occurred at Tynemouth. *Scolo. contractus* in abundance, beneath stones, at the north end of Whitley sands in March. *Stygnocoris rusticus* is from Hartley and at Long Benton. The very pretty *Derephysia foliacea* was found in cut grass near the same place in August, and at Whitley. *Campylostira brachycera* at Hartley in October. A winged female of *Pithanus Märkeli* was taken out of cut grass at Heaton, in July: *Phytocoris divergens* has occurred at Long Benton and Gosforth in August. New to Britain is *Dercœocoris alpestris:* one specimen was taken near Dilston in May, and another at Gibside in July; curious localities for an Alpine species, hitherto peculiar to the Alps at an altitude of five to six thousand feet. *Globiceps dispar* is also new to Britain. It occurred in some plenty near Hartley, at the roots of herbage; also in cut grass at Heaton in July. *Phylus palliceps* beaten out of bushes at Gosforth in August. One winged female of the common *Sphyracephalus ambulans* was found at Heaton in cut grass in July, and is the first British specimen found fully developed. *Sp. elegantulus* has occurred at Gosforth in September. *Pœciloscytus unifasciatus* is also from Gosforth. *Dichrooscytus rufipennis* taken at Axwell in August, *Zygonotus elegantulus* at Long Benton in August. *Salda cincta* is found at the roots of herbage, around the lake at Gosforth, from May to October. I have one male of *Hydrometra odontogaster* taken in March at Long Benton. The genus *Corixa* is tolerably well represented. We appear to have

C. Geoffroyi. Abounds in ponds and streams.

C. hieroglyphica. In ponds plentifully but local; Heaton, &c.

* On making my wishes known to Dr. Power, of London, he kindly (with the generosity for which he is so favourably known) forwarded me a great number of types, of which upwards of one hundred were of forms quite new to me. J. W. Douglass, Esq., has also added a goodly number of rarities. Those valued types, added to local captures, make up my collection to a little over two hundred and eighty species. not far short of the three hundred and fifty-two species recorded in the "British Hemiptera," by its talented authors.

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C. Sahlbergi. Very abundant in ponds.

C. Linnei. Rare.

C. semistriata. Ponds, &c.; common.

C. *nigrolineata.* Very common.

C. distincta. By no means rare.

C. præusta. Not rare at Heaton and Gosforth in August and September.

C. limitata. Rare.

Cymatia Bonsdorffii. Gosforth lake; somewhat rare.

XXIX.—*List of Coleopterous Insects added to the Fauna of Northumberland and Durham during the Years* 1865–6. By THOMAS JOHN BOLD.

1. *Bembidium* [*Tachys*] *quadrisignatum*, Dufts., Nat. Hist. Trans., I, 183. E. C. Rye, Ent. Monthly Mag., II, 185.

Although the locality has been since repeatedly searched, no further specimens of this interesting creature have been found.

2. *Colymbetes* [*Ilybus*] *sex-dentatus*, Schiodte, G. R. Crotch, Zool. 8999. E. C. Rye, Entomological Annual, 1865, 47.

A series, taken at Boldon Flats, are referred to this species by Mr. Crotch. The male has an obscure tooth on the intermediate claws.

3. *Hydroporus quinquelineatus*, Zetterstedt, E. C. Rye, l. c. 1863, 69.

Of this rare species, which appears to be a boreal one, I have a fine series taken in Prestwick Carr, in September.

Zetterstedt found it copiously in the north of Lapland, in the month of June.

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4. *Hy. celatus*, Clark, E. C. Rye, l. c. 71.

"In a little stream on a hill near Cheviot." Mr. G. R. Crotch.

5. *Gyrinus colymbus?* Erich., E. C. Rye, l. c. 1867, 58.

I have one specimen taken at Closing Hill, which I think may be this species.

6. *Haploglossa pulla*, Gyll., Kr. Ins. Deutsch., II, 80.

Very rare. One specimen at Long Benton in spring, and five others by sweeping the flowers of heath at Gibside, in August.

7. *Aleochara grisea*, Kraatz, E. C. Rye, l. c. 59.

Amongst Algæ on the coast, but rarely.

8. *Homalota velox*, Kr., E. C. Rye, l. c., 1864.

Yetholm, common, Mr. G. R. Crotch. Whitley sands, October, T. J. B.

9. *Ho. eremita*, Rye, E. C. Rye, l. c. 1867, 47.

Rare; one specimen only having occurred in our district. It appears to be tolerably abundant in Scotland.

10. *Ho. longula*, Heer., *Hydrosmecta longula*, Thomson, Skandinaviens Coleoptera, III, 13.

"Swarming in the river at Yetholm." Mr. G. R. Crotch.

11. *Placusa infima*, Erich., Thomson, l. c. III, 102.

Gosforth woods, but very rare.

12. *Gyrophæna lævipennis*, Thomson, l. c. II, 267.

Same locality as the preceding; occurring in fungi, &c.

13. *Tachinus proximus*, Kr., Ins. Deutsch., II, 401. E. C. Rye, l. c. 1865, 51.

I have one or two local specimens, which I think belong to this species.

14. *Lamprinus saginatus*, Grav., Thomson, l. c. III, 152.

Very rare; sea coast, near Whitley.

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15. *Philonthus tenuicornis*, Rey et Muls., = *P. punctiventris*, W. C., Club's Trans., VI, 50. E. C. Rye, l. c. 64.

16. *Ph. addendus*, Sharp, = *P. temporalis*, Muls., Club's Trans., VI, 50. E. C. Rye, l. c. 48.

17. *Othius myrmecophilus*, Kies., E. C. Rye, l. c. 65.

With us this species is quite as abundant as *melanocephalus*, from which the darker colour and thoracic punctures will readily separate it.

I have specimens from Bothal, Hartley, Long Benton, Gibside, Minsteracres, and have taken it in Cumberland. May and October.

18. *Stenus glacialis*, Heer, E. C. Rye, l. c. 66.

"A female specimen taken by Mr. R. Hislop in August, 1865, on the Cheviots."

19. *Thinobius longipennis*, Kies., Ins. Deutsch., II, 885.

"Yetholm, common." Mr. G. R. Crotch.

20. *Choleva longula*, Kell., E. C. Rye, l. c. 1866, 75.

Two specimens found in decaying fungi, at Bothal, have been referred to this species by my friend, Mr. E. C. Rye.

21. *Colon serripes*, Sahlb., Sturm, Deutschlands Insecten XIV, pl. CCLXXXI, fig. E.

One single specimen of this rarity was taken out of dead leaves, at Little Benton, in early spring.

22. *Anisotoma ornata*, Fairm., = *litura*, Steph., E. C. Rye, l. c. 1867, 111.

Exceedingly rare, only one example having occurred in our district.

23. *Agathidium clypeatum*, Sharp, E. C. Rye, l. c. 1866, 79.

New to science. Three specimens taken in Agarici, at North Seaton.

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24. *Ag. marginatum*, Sturm, Thomson, l. c. IV, 52.

Hartley in May, but very rare.

25. *Hister succicola*, Thomson, l. c. IV, 224.

Long Benton, Gosforth, and elsewhere. Sometimes found in decaying fungi.

26. *Epuræa parvula*, Sturm, l. c. XV, pl. CCXCV, fig. D.

In fungi, Gosforth; rare. September.

27. *Ep. oblonga*, Herbst., Sturm, l. c. XV, pl. CCXCV, fig. B.

"Two, Yetholm." Mr. G. R. Crotch.

28. *Meligethes ochropus*, Sturm, l. c. XVI, pl. CCCVI, fig. H. E. C. Rye, l. c. 1867, 72.

Rare; one specimen taken at Hartley, in May.

29. *M. erythropus*, Gyll., Sturm, l. c. XVI, pl. CCCX, fig. E.

Briar Dene and Hartley, in May and June.

30. *Puramecosoma melanocephala*, Herbst., Sturm, l. c. XVIII, pl. CCCXLI.

In tufts of grass, left on the bushes by floods. Hartford Bridge and Briar Dene, in May. I once took it in profusion near Lanercost, Cumberland, in a similar situation.

31. *Atomaria elongatula*, Erich., Sturm, l. c. XVIII, pl. CCCXXXII, fig. A.

Rare; Dene west of Hartley. July.

32. *Helophorus dorsalis*, Marsh.

Has occurred in Briar Dene in May, but somewhat rarely.

33. *Athous longicollis*, Oliv., = *crassicollis*, Boisd. et Lacord., I, 640. ♀

One female taken, near Gibside, by Mr. J. Kidson Taylor of Manchester, and most liberally ceded to my collection by him.

This specimen is a very curious pale variety, and differs so much in size and form from the male, that it is difficult to believe

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them to be of one species. The females of this group appear to be much more rarely found than the males.

34. *Cyphon nitidulus*, Thomson, l. c. VI, 133.

Common in our district; also in Cumberland.

35. *Cy. fuscicornis*, Thomson, l. c. 134.

Near Axwell, but rare.

36. *Cy. pallidiventris*, Thomson, l. c. 135.

Gosforth and elsewhere; frequent.

37. *Cy. nigricèps*, Thomson, l. c. 137?

We have an insect, not uncommon, which I think may be the one described by Thomson. Compared with types of *variabilis*, it is smaller, rather more depressed, more shining, and has constantly a black head: the antennæ, too, are darker and longer; and the fourth joint is twice the length of the third.

I quite indorse Mr. Crotch's opinion of the necessity of having examples from all parts before forming an opinion on specific value in this genus.

38. *Malthodes mysticus*, Kies., Thomson, l. c. VI, 199.

Amongst herbage; not rare. The abdominal segments are very peculiar in the male of this species.

39. *Ma. pellucidus*, Kies.. Thomson, l. c. 206.

I have several specimens of this rarity taken at Gosforth, and Gibside.

40. *Telmatophilus caricis*, Oliv., Thomson, l. c. V, 243.

Borders of the lake at Gosforth; rare.

41. *Anthicus quisquilius*, Thomson, E. C. Rye, l. c. 1867, 83.

I have several specimens which agree in the main with the author's description of this new species: the head is not wider than the thorax, the whole insect is proportionately narrower, less glossy, and paler in colour than the usual type of *floralis*. I strongly suspect, however, that these pale-coloured examples are

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the females, and the large, dark, glossy big-headed ones, the males of one and the same species. The knobs on the thorax, and the slightly broader anterior and intermediate tarsi rather favour this opinion.

42. *Salpingus æratus*, Muls., E. C. Rye, l. c. 1867, 84.

Three specimens, Yetholm. Mr. G. R. Crotch.

43. *Sitones lineellus*, Gyll., E. C. Rye, l. c. 85.

This fugitive species has at last proved to be undoubtedly British. With us it frequents the sea-banks, north of Whitley, where they are covered by rough herbage. Although not abundant, yet it keeps dropping into the net the whole season, mostly single specimens at a time.

44. *Barynotus Schönherri*, Zett., E. C. Rye, l. c. 86.

Equally common with *obscurus*. I took some very fine examples out of recently cut grass, at Heaton, in July.

45. *Otiorhynchus pabulinus*, Panz.

On melilot trefoil. Five specimens from Hartley, and one from South Shields. September.

46. *Acalles Ptinoides*, Marsh.

One specimen beneath a piece of wood at Gibside. May.

47. *Ceuthorhynchus quercicola*, Fab., W. C., 80, 15.

Rare; Heaton and Little Benton. June.

48. *Ceu. punctiger*, Gyll., E. C. Rye, l. c. 1866, 105.

Benton bank. July.

49. *Ceuthorhynchidius terminatus*, Herbst.

Very rare; Hartley. September.

50. *Hylastes palliatus*, Gyll.

Abounds wherever there are felled pine trees.

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51. *Haltica* (*Graptodera*) *longicollis*, Allard., E. C. Rye, l. c. 1867, 95.

On heath, not uncommon. I have specimens from Prestwick Carr, and others from the Cumberland Moors.

52. *Clambus pubescens*, Redt.

Hartley Dene; rare. May.

53. *Ptiluim concolor*, Sharp, E. C. Rye, l. c. 55.

Yetholm, common. Mr. G. R. Crotch.

XXX.—*Notice of the Life of the late Joshua Alder, Esq.* By D. Embleton, M.D.

By the death of Mr. Alder, on the 21st of January, 1867, at the ripe age of seventy-four years, Newcastle has lost a truly worthy and distinguished son, one of the brightest ornaments of British Natural History.

These our Societies have to mourn for one of their foremost members; and as our late friend and former President of the Tyneside Club had, throughout his life, endeared himself to all who knew him, and had shown us, by example as well as by precept, in what spirit Natural History ought to be studied, it is our duty to do honour to his memory by placing on record some authentic account of his career, though it is to be hoped that a memorial more substantial and useful than this notice, of one who has largely contributed to foster a love of nature in Newcastle, and to earn for his native town a deserved reputation for the successful study of Natural History, will ere long be founded by his numerous scientific and private friends.

The following memoir has been compiled with the kind assistance of Miss Alder, Mr. Joseph Blacklock, and Messrs. Albany and John Hancock.

Joshua Alder was born on Easter Eve, 1792, in Dean Street,

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Newcastle-upon-Tyne, three years after the formation of that thoroughfare. His parents were in business there, as provision merchants, on the west side, near the top of the street. When a child he went to school in Pilgrim Street, under Mr. and Mrs. Prowitt, whose daughters were afterwards celebrated school-mistresses for many years. He was afterwards sent to Tanfield School under his relative the Rev. Joseph Simpson, to whom many Newcastle men owe the rudiments of classics and mathematics. He left school early—at about the age of fifteen, and after the death of his father, which happened in November, 1808, he joined his mother in business. He had a brother, who died some years ago. His amiable sister survives to deplore his loss.

Neither his parents, nor his brother or sister, ever evinced any great fondness for science. Joshua, on the other hand, never liked business, though it was some years after leaving school that he first became attached to scientific pursuits.

His friends and companions about this time were Mr. T. Hancock and the late Messrs. William Hutton and George Burnett; Thomas Bewick was familiar to them all. He appears to have been a lad of observation, vivacity, and humour. He was fond of sketching portraits and caricatures on the kitchen walls with a burnt stick, and of holding boyish dramatic performances with puppets, which he manufactured chiefly himself, and for which he pronounced the speeches, and thus, amidst family gatherings of old and young, many a pleasant and joyous evening was spent. In the prosecution of these juvenile amusements we may observe the early evidence of his genial disposition, and the germs of those powers of observation and delineation which gradually grew up and developed themselves into talents of no mean order.

In his after life, it may be here observed, we find a strong similarity between the minds of Joshua Alder and his lamented friends, the late Professor Edward Forbes, and the late William Thompson, Esq., of Belfast: all three had the same genial humour and kindliness of disposition, the same deep-rooted love for the study of Natural History, the same powers of accurate and minute observation, and the same talents as trustworthy draughtsmen.

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In February, 1815, he became a member of the Literary and Philosophical Society of Newcastle, which was then located in the Groat Market. He attended, and delighted in, the lectures which were then being delivered before that Society, by the late Rev. W. Turner, on chemistry, electricity, and other branches of physical science, and it was some time after he began to attend those lectures that he was attracted by the charms of Natural History.

By degrees he commenced excursions into the country around, in company with Mr. T. Hancock and Mr. W. Robertson, an excellent botanist, and collected, first of all, mineralogical and geological, and then botanical specimens. Afterwards these excursions were extended to lengthened pedestrian tours through the lake and mountain districts of Cumberland, Westmorland, and Scotland. During these, conchological specimens were superadded to his already varied stores of treasures. At length he appears to have devoted himself almost exclusively to the study of British Conchology, working at it for about forty years, and in the latter part of his life to have joined, to this absorbing pursuit, the study also of the Zoophytes of Great Britain.

During this long period he visited from year to year, during the summer months, various parts of England, Wales, and Scotland, and the Bay of Dublin. On the east coast of England he frequented Berwick, Warkworth, Cullercoats, and Scarborough; and on the south coast, Torquay, Plymouth, and Falmouth—also Ilfracombe; in Wales, Swansea, Fowey, Tenby, and Beaumaris; in Scotland, Rothesay, Arran, Oban, and other localities on the western coast; and also the Isle of Man. At each of these places he stationed himself for a week or two, or at least a few days, when, free from care and business, and apart from the world, he quietly occupied himself in collecting, observing, and describing the objects of his pursuit, and in taking sketches, in pencil and chalk, of the beautiful scenery amid which he loved to sojourn.

On his return home he always had a portfolio of new sketches, as well as a valuable gathering of new objects of Natural History, to exhibit, and invariably spent a fortnight in autumn, at his

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favourite Cullercoats, examining the pools, rocks, and weeds of the littoral zone, and the fresh-drawn lines of the fishermen, who every morning returned from the labours and dangers of the sea.

He was everywhere accompanied by Miss Alder, who constantly attended to his simple wants and comforts, assisted him in his studies, and was, in short, essential to his life and health.

Thus it was that, by undivided devotion for many years to the systematic observation and collection of the different animals, in their natural resorts, and by careful study and arrangement of them at home, he was enabled slowly but surely to develope and mature his talents, and to amass the large Museum of British Shells and Zoophytes which was his pride, and one of the chief foundations of his fame as a naturalist.

He was one of the founders of the NATURAL HISTORY SOCIETY OF NORTHUMBERLAND AND DURHAM in the year 1839, and took a lively and active interest in the formation of its valuable Museum, the first honorary curators of which were Messrs. John Adamson, G. Gibsone, J. H. Fryer, and Joshua Alder. He gave important aid in naming and arranging the fossils; to the Conchological department he largely contributed by gifts, and with Mr. J. H. Fryer completed its arrangement. The beautiful collection of Corals, and other Zoophytes, presented to the Society by the Right Honourable the Earl of Tankerville, was also arranged by Mr. Fryer and Mr. Alder.

To the Transactions of the NATURAL HISTORY SOCIETY he contributed, in 1830, "A Catalogue of the Land and Fresh Water Testaceous Mollusca found in the Vicinity of Newcastle-upon-Tyne, with Remarks."* This, the most extensive local British Catalogue at that time published, contained seventy-one species, forty-five of land, and twenty-six of fresh-water species. For three or four years previous to the above date he had been zealously exploring the environs of his native town, and other parts, in company with Messrs. Albany Hancock and John Thornhill, and a perusal of the remarks at the end of the Catalogue shows that at that time he had accustomed himself to those minute and accurate observations which, in after years, rendered him so

* See Catalogue of Mr. Alder's works appended to this notice.

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reliable an authority in Conchology. A supplement to the Catalogue, communicated in 1835, raised the number of species to seventy-seven.

This Catalogue gave a new and vigorous impulse to the study of our native Conchology, which at that time seems to have been languishing, and raised Mr. Alder suddenly into a conspicuous position among his contemporaries.

When, in 1846, the Tyneside Naturalists' Field Club was founded, the original Committee consisted of Mr. J. H. Fryer, Mr. Joshua Alder, and Mr. T. K. Loftus; and a special Committee on Mollusca, Crustacea, and Zoophytes, contained the names of Messrs. J. H. Fryer, Joshua Alder, Albany Hancock, and John Hancock. The next year Mr. Alder was elected Vice-President, and in 1849, President of the Club. His address at the end of his year of office was characteristic of the man, clear, orderly, minute, and accurate in its particulars, replete with useful remarks and good advice, and concluded with the following recommendations as to the mode and spirit in which the study of Natural History should be pursued—"To search out nature's treasures in the woods and fields is a rational, a healthful, and a pleasant pursuit; but the naturalist who confines himself to the collecting and naming of specimens only, loses one half the pleasure and instruction which it is calculated to impart. The works of nature can never be rightly understood without an examination of the structure of the plants and animals he collects. Their habits, their uses, and the beautiful adaptation of their organs to the functions they have to perform, afford a highly interesting enquiry; and if the microscope be used, a still more wonderful and elaborate organization is revealed, extending even beyond the limits which our instruments can reach. In this way only can we truly appreciate the works of nature, and perceive how infinitely they surpass the rude efforts of human skill. Nor need we go far for examples, for rarity is not an element in this investigation—

"Not a tree,
A plant, a leaf, a blossom, but contains
A folio volume. We may read, and read,

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And read again, and still find something new,
Something to please, and something to instruct,
E'en in the noisome weed."

To the first Volume of the Transactions of the Club he contributed, in addition to "A Catalogue of the Mollusca of Northumberland and Durham," which contained sixty species more than the Catalogue in the Transactions of the NATURAL HISTORY SOCIETY, five other papers on kindred subjects.

To the second and third Volumes two small papers, and (in 1856) "A Catalogue of the Zoophytes of Northumberland and Durham," containing one hundred and sixty-four species, of which seventeen at least were new.

To the fourth Volume, papers "On a new Holothurian," and "On a new Sertularian Zoophyte," were contributed.

To the fifth Volume, a paper "On a new Sea Pen," "A Supplement to the Catalogue of Zoophytes," and "A Report on the Zoophytes from a dredging Expedition."

To the sixth and last Volume, "A Report on another dredging Expedition."

To the first Volume of the NATURAL HISTORY TRANSACTIONS OF NORTHUMBERLAND AND DURHAM (the continuation of the Transactions of the NATURAL HISTORY SOCIETY and of those of the TYNESIDE CLUB combined), he gave a paper "On three new Polyzoa," and "A Report on the Mollusca and Zoophytes obtained from the dredgings of three years." These bear the date of 1865.

Various contributions of papers had during this period, from 1839 to 1865, been made from time to time to "The Magazine of Zoology and Botany," and then to its successor "The Annals and Magazine of Natural History;" to the Transactions of the Zoological Society; to the "Philosophical Magazine;" to the "Journal of Microscopical Science;" and to the "Reports of the British Association for the Advancement of Science." These were written either by himself alone, or in conjunction with his friend Mr. Albany Hancock, and will be found specified in the appended Catalogue of his works.

The great work "On the British Nudibranchiate Mollusca," by Joshua Alder and Albany Hancock, published in the years

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1845–55, by the Ray Society, has obtained a name and a celebrity for its authors which will last as long as the study of Natural History shall be held in honour, and its praise is to be found in every published treatise on that science. The Zoological portion of the work is the joint production of the authors. We owe the anatomy and splendid plates to Mr. Albany Hancock.

Each of the authors of the Monograph on the Nudibranchiata had the honour of being presented by Prince Albert with a copy of "The Natural History of Deeside and Braemar," composed by the late Dr. Macgillivray, edited by Dr. Lankester, and which had recently been printed by command of Her Majesty for the benefit of Mrs. Macgillivray.

On the Continent the Monograph was highly appreciated, and its authors were made honorary members of the Imperial and Royal Botanical and Zoological Society of Vienna.

Another and similar work "On the British Tunicata," to be published by the same admirable Society, has been for some time in preparation by the same authors. Of this, unhappily, Mr. Alder has not been spared to see the completion, though he was at work upon it at the commencement of the attack that terminated in his death. It is gratifying to know, however, that he had accumulated a vast amount of material on the subject, and has left a beautiful series of drawings illustrative of the species. His collection, too, of specimens in this department of Natural History is, there can be no doubt, the most extensive in Great Britain. In the hands of Mr. Albany Hancock the work is now steadily progressing, and no doubt can be entertained that, when published, it will be found a worthy companion to that on the Nudibranchiata.

As Mr. Alder's writings on Natural History are too numerous to be readily noticed separately and commented on at this time, it has been thought advisable simply to add to this notice an entire list of them with references. Some it will be seen have been translated into French or German.

For this list the Club is indebted to the care of the Rev. A. M. Norman, of Newbottle.

The papers are upwards of fifty in number, and it may be

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added that they all contain a considerable amount of original matter, which from time to time materially extended the boundaries of our knowledge of Mollusca and Zoophytes.

The Catalogues of Mollusca and Zoophytes are not mere lists of names arranged in definite order, they are Catalogues descriptive of the species, and interspersed with a variety of useful information.

In disposition Mr. Alder was mild, genial, and unobtrusive, willing at any time to impart his knowledge to others with much affability, and never allowing an opportunity to escape him of encouraging the young and inexperienced student. In conduct upright and honourable, he was, in feeling, word, and deed, a gentleman.

The accuracy of his judgment, and his nice discrimination in the determination of species, in his peculiar departments, were acknowledged wherever such studies were pursued, and much of his time of late years was taken up in critically examining and naming collections submitted to him by his numerous scientific friends. In this way he rendered much good service to science in his own quiet unostentatious way.

He terminated his connection with business in or about the year 1840, and after that devoted himself exclusively to his favourite studies.

A great calamity, in which he had unfortunately many fellow-sufferers, befel him in 1857, in the failure of the Northumberland and Durham District Bank. By this he lost all his property and savings in a moment, yet no one ever heard him complain; no word of blame or of anger escaped him. He knew how to keep an even mind in adversity, as he had done in prosperity, and he was one of those few persons who have not had the extreme pain of being, in adversity, forsaken by their friends.

A numerously and rapidly signed representation, containing the names of all our celebrities in science, and of troops of other friends, was made to the Government, who ultimately gave him from the Civil List a pension of £70 per annum. Powerful private friends, too, in the most delicate and handsome manner, came to his succour, and arrangements were entered into that

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enabled him to pursue in competence and peace, for the rest of his life, those studies to which he was so much attached, and which he had so well illustrated.

He was the fast friend and loved associate of many of our best naturalists. Mr. J. G. Jeffreys, of Swansea, and he had known and appreciated each other for five and forty years. The two Goodsirs, Edw. Forbes, Sylvanus Hanley, Drs. Carpenter, Baird, and J. E. Gray, of the British Museum, Dr. Johnstone, of Berwick, William Thompson, Professors Allman and Balfour, of Edinburgh, Dr. Bowerbank, and many others, held him in the highest esteem.

He corresponded with Lovèn, Van Beneden, Sars, Milne Edwards, Verany, and other celebrated naturalists of the Continent.

His health, which had always been delicate, became during the latter years of his life gradually more and more infirm. His hearing had been imperfect for many years. He was afflicted with the painful consequences of prostatic disease, and within the last four or five years his life had been on several occasions in imminent jeopardy; but owing to his previous careful living, by which he had avoided, as much as possible, all sources of disease, and husbanded the resources of his constitution, to the skilful surgical treatment of Dr. Gibb, and to the devoted and untiring care of his sister, to whom he was tenderly attached, he survived to be cut off by an attack of pleurisy, retaining his mental faculties, and manifesting his love of Natural History, up to within a few hours of his decease. His long and painful trials were borne with singular Christian patience, meekness, and philosophy.

The portrait of Mr. Alder, which forms the frontispiece to the present volume, has been copied, by the kind permission of Messrs. Maull and Polyblank, from the photograph published by that firm.

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LIST OF THE PUBLICATIONS OF MR. ALDER.

(1.) 1831. A Catalogue of Land and Fresh Water Testaceous Mollusca found in the Vicinity of Newcastle-upon-Tyne, with Remarks. Trans. Nat. Hist. Soc. Northumberland, Durham. and Newcastle-upon-Tyne, Vol. I, p. 26–41.

[Catalogue des Mollusques terrestres et fluviatiles de Newcastle-sur-Tyne. Féruss Bull. Sc. Nat., Vol. XXVII, p. 195–198.]

(2.) 1838. Supplement to the above. Trans. Nat. Hist. Soc. Northum., &c., Vol. II., p. 337–342.

(3.) 1838. Notes on the Land and Fresh Water Mollusca of Great Britain, with a revised list of the species. Magaz. Zool. Bot., Vol. II, p. 101–119.

(4.) 1841. Observations on the genus Polycera of Cuvier, with descriptions of two new British species. Ann. Nat. Hist., Vol. VI, p. 337–341.

(5.) 1842. Alder (J.) and Hancock (A.), Descriptions of several new species of Nudibranchous Mollusca found on the coast of Northumberland. Ann. Nat. Hist., Vol. IX, p. 31–36.

(6.) 1842. Remarks on *Lottia Virginia*. Ann. Nat. Hist., Vol. VIII, p. 404–406.

(7.) 1843. Alder (J.) and Hancock (A.), Notice of a British species of Calliopœa D'Orb., and of four new species of Eolis, with observations on the development and structure of the Nudibranchiate Mollusca. Ann. Nat. Hist., Vol. XII, p. 233–238.

(8.) 1844. Alder (J.) and Hancock (A.), Sur le dévelloppement des Nudibranches. L'Institut, Vol. XII, No. 536, p. 119.

(9.) 1844. Alder (J.) and Hancock (A.), Remarks on the genus Eolidina of M. de Quatrefage. Ann. Nat. Hist., Vol. XIV, p. 125–129.

(10.) 1844. Alder (J.) and Hancock (A.), On Pterochilus, a new genus of Nudibranchiate Mollusca, and two new species of Doris. Ann. Nat. Hist., Vol. XIV, p. 329–331.

(11.) 1844. Alder (J.) and Hancock (A.), Description of a new genus of Nudibranchiate Mollusca, with some new species of Eolis. Ann. Nat. Hist., Vol. XIII, p. 161–166.

[Ent. in Ann. Scienc. Natur. 3 Sér. Zool., Vol. I, p. 190, 191.]

(12.) 1844–1855. Alder (J.) and Hancock (A.), Monograph of the British Nudibranchiate Mollusca, 4to, 83 coloured plates. Published by the Ray Society.

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(13.) 1844. Descriptions of some new British species of Rissoa and Odostomia. Ann. Nat. Hist., Vol. XIII, p. 323–328 with a plate.

(14.) 1845. Alder (J.) and Hancock (A.), Report on the British Nudibranchiate Mollusca. Report Brit. Assoc. Adv. Sci., 14 Meet., 1844 (1845), p. 24-29.

(15.) 1845. Alder (J.) and Hancock (A.), Report on the British Nudibranchiate Mollusca. London, Baillière, 1845.

(16.) 1845. Alder (J.) and Hancock (A.), Notice of a new genus and several new species of Nudibranchiate Mollusca. Ann. Nat. Hist., Vol. XVI, p. 311–317.

[Sur le Dendronotus, n. g. de Nudibranches, L'Institut XIII, No. 612, p. 338.]

(17.) 1845. Note on Euplocamus, Triopa, and Idalia. Ann. Nat. Hist., Vol. XV, p. 262-264.

(18.) 1846. Alder (J.) and Hancock (A.), Notices of some new and rare species of Naked Mollusca. Ann. Nat. Hist., Vol. XVIII, p. 289–294.

(19.) 1848. A Catalogue of the Mollusca of Northumberland and Durham. Trans. Tyneside Nat. Field Club, Vol. I, p. 97–209.

[Also published as a separate paper, p. 115.]

(20.) 1848. Alder (J.) and Hancock (A.), Additions to the British species of Nudibranchiate Mollusca. Ann. Nat. Hist., 2 Ser., Vol. I, p. 189–192.

(21.) 1848. Alder (J.) and Hancock (A.) On a proposed new order of Gasteropodous Mollusca. Ann. Nat. Hist., 2 Ser., Vol. I, p. 401–415.

(22.) 1848. Description of a new British Limnæa. Ann. Nat. Hist., 2 Ser., Vol. II, p. 396–397.

(23.) 1848. On the animal of Lepton squamosum. Rep. Brit. Assoc. Adv. Sci., 17 Meet., 1847 (1848), Trans. Sec. p. 73.

(24.) 1849. On the animal of Kellia rubra. Ann. Nat. Hist., 2 Ser., Vol. III, p. 383–386, and Vol. IV, p. 48-56.

(25.) 1849. On the branchial currents of the Bivalve Mollusca. Ann. Nat. Hist., 2 Ser., Vol. IV, p. 242–245.

[Neber die kiemenströmungen der Bivalven. Fror. Tagsber., No. 35 (Zool. Bd. 1), 1850, p. 51–53.]

(26.) 1850. Address to the members of the Tyneside Nat. Field Club, at the fourth anniversary meeting, delivered by Joshua Alder, President. Trans. Tyneside Nat. Field Club, Vol. I, p. 311–326.

(27.) 1850. Additions to the Mollusca of Northumberland and Durham. Trans. Tyneside Nat. Field Club, Vol. I, p. 358–365.

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(28.) 1850. An account of three new species of Animalcules. Trans. Tyneside Nat. Field Club, Vol. I, p. 365–367.

(29.) 1850. Notes on Montacuta ferruginosa. Ann. Nat. Hist., 2 Ser., Vol. V, p. 210–213.

(30.) 1851. On the genus Jeffreysia. Ann. Nat. Hist., 2 Ser., Vol. VII, p. 193–196.

(31.) 1851. On the distinctive characters of Jeffreysia and Chemnitzia. Ann. Nat. Hist., 2 Ser., Vol. VII, p. 460–465.

(32.) 1851. Alder (J.) and Hancock (A.), Descriptions of two new species of Nudibranchiate Mollusca, one of them forming the type of a new genus, with the anatomy of the genus, by Albany Hancock. Ann. Nat. Hist., 2 Ser., Vol. VIII, p. 290–302.

(33.) 1851. Alder (J.) and Hancock (A.) On the branchial currents of Pholas and Mya. Rep. Brit. Assoc. Adv. Sc., 21 Meet., 1851, Trans. Sec., p. 74–75, and more fully Ann. Nat. Hist., 2 Ser., Vol. VIII, p. 370–378, with a plate.

[Translated Fror Tagsber, No. 538 (Zool. Bd. 3), 1852, p. 11–16, and Ann. Sci. Nat., 3 Sér., Zool., Vol. 15 (1852), p. 380, 381.]

(34.) 1852. Alder (J.), and Hancock (A.), Descriptions of two new species of Nudibranchiate Mollusca, one of them forming the type of a new genus. Report Brit. Assoc. Ad. Sci., 21 Meet., 1851 (1852), Trans. Sec., p. 74.

(35.) 1854. A reply to some statements of Dr. Williams on the controversy respecting the branchial currents in the Lamellibranchiata. Ann. Nat. Hist., 2 Ser., Vol. VIV, p. 177–182.

(36.) 1854. Alder (J.) and Hancock (A.), Notice of some new species of Nudibranchiate Mollusca. Ann. Nat. Hist., 2 Ser., Vol. XIV, p. 102–105.

(37.) 1856. A notice of some new genera and species of British Hydroid Zoophytes. Report Brit. Assoc. Ad. Sci., 26 Meet., 1856 (1857). Trans. Sec., p. 90, 91, and more fully Ann. Nat. Hist., 2 Ser., Vol. XVIII, p. 353-362, with 3 plates.

(38.) 1856. Descriptions of three new British Zoophytes. Ann. Nat. Hist., 2 Ser. Vol. XVIII, p. 439–441, with a plate.

(39.) 1857. A Catalogue of the Zoophytes of Northumberland and Durham. Trans. Tyneside Nat. Field Club, Vol. III. Also published separately, pp. 72, with 8 plates.

(40.) 1857. Notes on Sepia biserialis and Sepia elegans. Ann. Nat. Hist., 2 Ser., Vol. XIX, p. 474.

(41.) 1859. Descriptions of three new species of Sertularian Zoophytes.

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Ann. Nat. Hist., 3 Ser., Vol. III, p. 353–356. Also in part, Trans. Tyneside Nat. Field Club, Vol. IV, 177–179. pl. XI, XII.

(42.) 1860. Descriptions of a Zoophyte and two species of Echinodermata new to Britain. Ann. Nat. Hist., 3 Ser., Vol. V, p. 73–75, with plate.

(43.) 1860. Notice of the occurrence on this (Durham) coast of a Holothurian (Cucumaria elongata) new to Britain. Trans. Tyneside Nat. Field Club, Vol. IV, p. 43, 44, pl. II, fig. 3.

(44.) 1861. Occurrence of a Sea Pen (Virgularia Christii) new to Britain. Trans. Tyneside Nat. Field Club, Vol. V, p. 60.

(45.) Alder (J.) and Hancock (A.), Descriptions of a new genus and some new species of naked Mollusca. Ann. Nat. Hist., 3 Ser., Vol. X, p. 261–265.

(46.) 1863. Observations on the British Tunicata, with descriptions of several new species. Ann. Nat. Hist., 3 Ser., Vol. II, p. 158–173, pl. VII.

(47.) 1863. Supplement to a Catalogue of the Zoophytes of Northumberland and Durham. Trans. Tyneside Nat. Field Club, Vol. V, p. 225–247, pl. VIII–XI.

(48.) 1863. Report on the Zoophytes obtained in a Dredging Expedition to the Dogger Bank. Trans. Tyneside Nat. Field Club, Vol. V, p. 288-290.

(49.) 1864. Descriptions of new British Polyzoa, with remarks on some imperfectly known species. Rep. Brit. Ass. Ad. Sci., 33 Meet., 1863 (1864), Trans. Sec., p. 97; and in full, illustrated with 4 plates, 4to, Jour. Micros. Sci., Vol. IV, p. 95–109, pl. II–V.

(50.) 1864. Alder (J.) and Hancock (A.), Notice of a Collection of Nudibranchiate Mollusca made in India, by Walter Elliot, Esq., with descriptions of several new genera and species. Trans. Zool. Soc., Vol. V, p. 113–147, pl. XXVIII–XXXIII.

(51.) 1864. Reports on the Mollusca and Zoophytes obtained during Dredging Operations on the coasts of Northumberland and Durham in July and August, 1863. Trans. Tyneside Nat. Field Club, Vol. VI, p. 180–183 and 191–193.

(52.) 1865. Reports on the Mollusca and Zoophytes obtained in Deep-Sea Dredging on the coasts of Northumberland and Durham, 1862–4. Nat. Hist. Trans. of Northumberland and Durham, Vol. I, p. 5–11, and 45–50.

(53.) 1866. A Description of a second British species of the genus Pennatula (*P. mollis*, Alder) procured by the British Association's Dredging Committee in the summer of 1866, in the

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Hebridean Seas, read at the Meeting of the British Association at Nottingham, and will be published in the forthcoming Report.

The following is the genus and a list of the species named in honour of Mr. Alder.

Genus. Alderia (Allman), a genus of Nudibranchiate Mollusca.

Species. Natica Alderi (Forbes).
Jeffreysia Alderi (Carpenter).
Rissoa Alderi (Jeffreys).
Eolis Alderi (Cocks).
Bicellaria Alderi (Busk).
Aysidota Alderi (Busk).
Montacuta Alderi (Bate).
Megamæra Alderi (Bate).
Corynopsis Alderi (Hodge).
Polyenia Alderi (Forbes).
Zoanthus Alderi (Gosse).
Isodyctya Alderi (Bowerbank).
Cliona Alderi (Hancock.)

XXXI.—*Note on the Excavating Sponges, with Descriptions of four new Species.* By Albany Hancock, F.L.S. (Plates XVI, XVII.)

Since the publication of my paper on the excavating sponges* I have re-examined nearly all the species therein described, and have carefully investigated several new and interesting forms from various parts of the world; and as a result of these researches, I have only become more confirmed in the opinion, that these lowly organized creatures are endowed with the power, of whatever nature it may be, of forming the crypts and channels in shell and other hard calcareous bodies within which they lie concealed. The means by which this work is achieved is still, I frankly admit, involved in much obscurity.

* Ann. and Mag. of Nat. Hist., 2nd Series, Vol. III. p. 321. May, 1849.

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Shortly after the appearance of the paper above alluded to, I satisfied myself that the larger bodies found in contact with the surface of *Cliona celata* were not organically connected with it as I originally thought, but were really nothing more than decalcified portions of the horny membranous tissue of the oyster shell within which the *Cliona* was buried, and sometime ago I wrote to Dr. Bowerbank to this effect.* If, therefore, *Cliona* works out the cavities it inhabits in the manner I supposed, namely, mechanically, it must be by the aid of the smaller bodies described in my paper, or by the spicula themselves.

My object however is not, on the present occasion, to discuss the means by which *Cliona* excavates its habitation, but rather to give some additional specific characters that distinguish the British species, and which originally escaped observation. But in the first place it must be stated, that Dr. Bowerbank is not exactly correct when he asserts, as he has done in the second volume, p. 216, of his recently published "Monograph of the British Spongiadæ," that I have divided Dr. Johnston's *Halichondria celata* into twelve species. It does not appear that Dr. Johnston ever saw any one of the species described by me: there is certainly nothing in his description to show that he had examined more than one form of *Cliona*.† Neither do I see any reason for believing that Dr. Bowerbank himself has enjoyed any greater advantage; for if he had had in his possession specimens of my species, he assuredly would never have written that "nearly all these proposed new species have the same habit and the same forms of spicula, with only such an amount of variation in size and form as may readily be found in a single field of view beneath the microscope, in any well-known specimen of *Halichondria celata* of Johnston when mounted in Canada balsam."‡

* On the 28th February, 1866.

† This however does not appear to have been Dr. Johnston's own opinion. In a letter I had the pleasure of receiving from that excellent naturalist, shortly after the publication of my paper on *Cliona*, speaking on the subject, he says, "I have no doubt my *C. celata* embraces several species." But this was a hasty utterance written on the spur of the moment, and probably meant nothing more than an expression of his conviction that there were more than one species of British *Cliona*.

‡ "Monograph of the British Spongiadæ." Vol. II, p. 216.

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Now, I have numerous slides so mounted of *Cliona celata*, Grant, which species is undoubtedly the same as Johnston's second variety under that specific denomination, and I have never found on any of them more than one form of spiculum, or any of the forms that characterize *Cliona Northumbrica*, *C. gracilis*, *C. Howsei*, *C. Alderi*, *C. corallinoides*, *C. lobata* or *C. vastifica;* neither have I in any of these species found the exact form of spiculum that distinguishes *C. celata*. In fact the habit of the sponge, and the characters of the spicula are so well pronounced, that with the exception of one, which I admit to be critical, few naturalists, after a careful examination of the species I have described, will doubt their distinctness.

And here it may be observed, that the study of *C. celata* alone is not sufficient for the full comprehension of the questions connected with the excavating sponges. This species is not by any means typical of the group; it has but one form of spiculum, while by far the greater number have two or three kinds, and the sponge itself does not assume, in a decided manner, that lobed structure which is so dominant in the genus. All the British forms should be carefully examined; and the foreign, which are very abundant, should be investigated with equal assiduity. When this is done, there will be little difference of opinion on most questions connected with the subject.

When I drew up the descriptions of the species I had not mounted any of the spicula in balsam; it was not till sometime afterwards that this was done, and the discovery made that a third minute form of spiculum had been overlooked in several of the species. It was unfortunate that this had escaped observation in the first instance, as it aids materially in distinguishing the species, though the characters originally given appear amply sufficient for the purpose.

Cliona celata possesses only pin-like spicula according to all writers on the subject, and it is equally true that most of the *Clionæ* have likewise pin-like forms; but in very many instances they have also associated with them other forms; and it is such association of various kinds of spicula that chiefly characterizes the species, and that distinguishes most of those I have described

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from *C. celata*. Dr. Bowerbank, however, denies the existence of a second kind, a fusiform, or "acerate" spiculum, in any of the British species.* This distinguished naturalist believes the fusiform spicula described by me to be adventitious—adhering accidentally to the surface of the sponge. Such belief is perfectly untenable. The fusiform spicula are not attached to the surface as assumed by the doctor, but are imbedded throughout the substance of the sponge in vast numbers: they are certainly numerically equal to the pin-like form, as is stated to be the case in the original descriptions of *C. corallinoides* and *C. canadensis*. There is no more reason for supposing the fusiform spicula to be adventitious than there is for assuming the pin-like forms themselves to be so; both kinds undoubtedly belong to the organism. It may also be stated that numerous foreign species, examined by me, have similar fusiform spicula associated with the pin-like form, and in many instances there is likewise present the third minute kind already mentioned, as occurring in several of the British species. But even when only the pin-like spicula are found they are usually sufficiently characteristic to distinguish the species. When, however, this form is, as just stated, associated with other kinds of spicula, there can rarely be any doubt on the subject.

All the three forms of spicula are found in all the membranes of the sponge. In such species as *C. Northumbrica*, *C. corallinoides*, and *C. vastifica*, the pin-like form is the least numerous, being only sparingly distributed in the internal membranes, though they are densely crowded in the papillæ, where they are arranged longitudinally, in parallel order, with the heads mostly in one direction, so that when the papillæ are flattened or retracted, they assume a radiating disposition. The fusiform spicula are in vast numbers in connection with the external and internal membranes, and occur also in the papillæ, where they are frequently arranged transversely. The minute spicula are found everywhere, but in greatest numbers in the external membrane, particularly on the papillæ: they are sometimes crowded together in vast multitudes. In the species which have only

* "Monograph of the British Spongiadæ." Vol. II, p. 216.

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pin-like spicula, these spicula equally pervade all the membranes; but I have not observed that they assume any definite arrangement in the papillæ, though in *C. globulifera* (one of the species described in the sequel of this paper), which has only the pin-like form, they are occasionally arranged in a radiating manner in the internal membranes. Thus it appears that in some instances, at least, *Cliona* does show a limited degree of order in the distribution of the spicula.

It must not however be supposed, that the spicula supply the only characters that distinguish the species: the colour of the sponge must also be taken into account, as well as the size, number, and distribution of the papillæ, the general habit and mode of branching, or, in other words, the size and character of the burrows containing the sponge, are highly characteristic. But here again we are unfortunately at issue with Dr. Bowerbank, who asserts, that these burrows are made by "lithodomous annelids,"* and consequently that the branching of the sponge is accidental, being entirely dependent for its character on the form of the cavities within which the sponge is lodged, being moulded, in fact, in worm-burrows. I shall not here reiterate the facts and arguments brought forward in my former paper to refute such an opinion. It may, however, be asked, how it is that while *C. celata* is found in vast abundance on our coasts, inhabiting excavations in shells and limestone, the worm or annelid assumed to have made these cavities has never yet been determined. Surely, if these are worm-burrows, we ought naturally to expect to find the makers of them, as frequently at least as *Cliona*, in peaceable undisputed possession of their habitations. But no, *Cliona* alone occupies these cavities; no worm has yet been taken that the naturalist can pronounce to have made them. Then why not allow *Cliona* to be the fabricator, as it is the constant possessor, of its excavated home?

Dr. Bowerbank indeed mentions "several" instances of having found annelids occupying the "numerous sinuous canals" in large balani from the Guliot caves in Sark; and also of finding "living annelids in deeply-seated portions of the perforations in

* "Monograph of the British Spongiadæ." Vol. II, p. 217 and 221.

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the limestone boulders of Tenby."* There is nothing surprising in this; in fact, we might have expected such instances to have occurred much more frequently to a naturalist of Dr. Bowerbank's experience. Many worms and other marine animals conceal themselves in any hole or crevice they can find, and numerous worms or annelids perforate both shells and limestone, and other hard calcareous bodies. Living worms, occupying their own burrows in these substances, are frequently met with; and it is not uncommon to find such burrows in shells perforated by *Cliona*, and mingling, in the most intricate manner, with the excavations of the latter. But there is never any difficulty in determining which was made by the worm, which by the sponge. And if the instances mentioned in the "Monograph of the British Spongiadæ" are genuine worm-burrows, neither can there be, in these cases, any uncertainty as to the fact of their being so.

Worm-burrows are always linear, usually cylindrical, and are more or less tortuous: they never assume a dendritic form, are sometimes double, or as it were bent upon themselves, and a little flattened; the surface is invariably smooth, never punctured or shagreened, as it is in the burrows of *Cliona*, the excavations of which, on the contrary, are always dentritic, dividing dichotomously, anastomosing, usually constricted at intervals, by perforated septa, so as to form a congeries of small chambers, and having the surface constantly punctured or shagreened, and generally giving off, on every side, numerous delicate cœcal tubes.

To account "for the vast number of perforated *shells*, and the comparative rareness of the annelids," it is suggested in the work on the British Spongiadæ before quoted,† that the worms, assumed to have made these perforations, obtain their nutriment by passing the excavated substance, "abounding in animal matter," through the digestive organs; the analogy of the earth-worm being relied on. Unfortunately, however, for the advocacy of such an idea, the excavations inhabited by *Cliona* are of the same character, and equally extensive in *limestone*. Whatever

* "Monograph of the British Spongiadæ." Vol. II, p. 221.

† "Monograph of the British Spongiadæ." Vol. II, p. 220.

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made these burrows in the one material, also made them in the other; of this there can be no doubt. And yet it would be very hard to believe that these hypothetical worms would be able to derive much nutriment from limestone, however much they might obtain from shell. This fact, indeed, sufficiently disproves the nutritive theory, and the difficulty still remains, with those who assume the agency of worms, to account for the great number and vast extent of the excavations occupied by *Cliona*, and the almost entire absence of worms.

But there is another equally formidable obstruction in the way of attributing these excavations to worms, and which appears to be perfectly insurmountable. In all the excavations occupied by *Cliona* there are numerous circular orifices, opening at the surface of the shell or stone containing the parasite. Now, the papillæ or oscula of the sponge, communicating with the water, always protrude through these apertures, and invariably correspond to them in size, number, and position, leaving no orifice unoccupied and exactly fitting each, whether there be upwards of two hundred to the square inch as in *C. vastifica*, or only about twenty-five, or less, as in *C. celata*. How are we to account for such a fact as this, if it be maintained that these orifices were drilled by worms? Are we to consider that this complete correspondence between these parts of the sponge and the orifices is a mere chance coincidence (wonderful indeed if true!) or that the worm made the openings purposely, in strict accordance with the requirements of the sponge that on some future day might take up its abode in the deserted excavation? or is it that the sponge has the power of modifying the position, number, and size of these important organs to meet the circumstances of its usurped home? The two first propositions cannot be entertained for a moment; and the last is contradicted by the fact that *C. vastifica* is never found with few and large papillæ like *C. celata;* nor in the latter species are they ever very numerous and minute as is the case with the former. And, indeed, the arrangement, size, and number of the papillæ are good specific characters throughout the species.

If we now refer to what is stated in my former paper on the

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subject already quoted, and at the same time take into account what is advanced on the present occasion, we shall find that the following facts seem to be sufficiently demonstrated. And they certainly appear cogent enough to satisfy the most scrupulous enquirer that *Cliona* excavates for itself its abode in hard calcareous bodies.

First.—That the sponge, when examined in a good state, is always found to fill every part of the excavation, even to the minutest ramification.

Secondly.—That the excavations are as frequently in limestone as in shell.

Thirdly.—That no worm has been found that can be pronounced to have made these excavations, and that worms are rarely or never taken in them.

Fourthly.—That these excavations have no resemblance whatever to the burrows of worms.

Fifthly.—That the surface of the excavations inhabited by *Cliona* is always shagreened or punctured in a peculiar manner; while that of the burrows of worms is always smooth.

Sixthly.—That *Clionæ*, with the papillæ of the same size, number, and arrangement, and with the same kind of spicula, always occupy similar burrows.

Seventhly.—That the oscula or papillæ always correspond in size, number, and position to the external orifices in the surface of the shell or stone enclosing the sponge.

Eighthly.—That *Cliona* has been traced through every stage of growth, from the microscopic gemmule adding branch after branch and lobe to lobe, to the fully developed sponge, excavating step by step its complicated abode in sound, transparent shell.*

Cliona undoubtedly works out the cavities that it inhabits, whether mechanically or otherwise. Whatever the process may be, the difficulty in believing that a sponge, even if deprived of all mechanical agency, can burrow into hard substances, is much lessened since I first wrote on the subject. It has recently been ascertained that some of the *Polyzoa* bury themselves in hard calcareous bodies; as does also *Lagotia viridis*, a minute and

* Ann. and Mag. of Nat. Hist., 2nd Series, Vol. III, p. 327. Pl. IV, fig. 4.

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feeble animalcule;* and it is now well known that certain unicellular *Fungi* live immersed in the shells of mollusks and in other hard calcareous bodies.† And surely, since such is the case—since plants, without motion or any mechanical aid, work out for themselves crypts and channels in hard shell, there can be no difficulty in the way of believing in the possibility of a sponge forming its habitation within substances of the same nature. And it is interesting to observe how similar the ramifications of these *Fungi* are to those of *Cliona*, the resemblance being so close, in many instances, as to lead to the idea that they might prove to be microscopic sponges had we not the high authority of Kölliker for believing in their fungoid nature.

Before concluding these remarks, a word or two may be said on a certain relation that appears to exist between *Cliona* and the *Foraminifera*. All the excavating sponges display a lobed structure, some of them to a very remarkable degree. The lobes are usually angulated, or more or less rounded, and are always connected together by exceedingly short constricted stems into branches, which dividing dichotomously anastomose, the division and anastomoses usually going on to such an extent that the sponge ultimately becomes a congeries of small lobes. Now, the sarcode of the *Foraminifera* is generally composed of a series of similar lobes, which are united in like manner by short constricted stems, or "stolons," as they are called, only differing from *Cliona* in the fact that they are usually arranged either spirally or cyclically, and do not assume a regularly branched character; but nevertheless the arrangement of the lobes in the two groups is occasionally very similar.

If we remove the testaceous covering of any of the *Rotalinæ* and suppose the sarcode unrolled, we shall see at once how much the structure resembles a branch of *Cliona corallinoides* for instance: both are composed of a series of nodules or lobes united by very short constricted stems. The sarcode of *Nodosaria*,

* Described by Strethill Wright, M.D., in the Edinburgh New Philosophical Journal, new Series, Vol. VII, p. 276.

† "On the frequent occurrence of vegetable parasites in the hard structures of animals." Ann. and Mag. of Nat. Hist., 3rd Series, Vol. IV. p. 300, Oct., 1859.

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however, requires no unrolling to exhibit this relationship; but it will be best understood on comparing the figures of the various species illustrating my paper before referred to on the excavating sponges with the many instructive figures of the sarcode given in Dr. Carpenter's "Introduction to the study of the Foraminifera," published by the Ray Society. On examining the representation of the cast of the chambers of *Orbitoides Fosteri* therein given from Ehrenberg,* it is seen that the chambers or lobes are arranged cyclically, but in a radial direction they assume a branched distribution; and if we trace the connection of the lobes (pl. I, fig. 8) from the centre to the circumference, beginning with those next the primordial lobe, we can easily observe that they are not merely connected into branches by delicate stems, but that these branches divide dichotomously and anastomose very much in the same manner as do those of *Cliona*. Indeed, the structure appears to be essentially the same in both, differing only in the fact that in *Orbitoides* the lobes, in addition to a branched, partake of a cyclical arrangement.

Should this similarity in the structure of the *Foraminifera* and *Cliona* be anything more than a mere vague analogy, spicula might be expected to occur in some species of the former, and accordingly such seems to be the case. A few years ago Dr. J. E. Gray discovered spicula in a new generic form, designated by him *Carpenteria*,† and at the time he commented on the fact as proving the connection supposed to exist between the *Foraminifera* and the *Porifera*: it is possible, however, that these spicules may be parasitic. It would therefore seem likely that there is something real in the relationship pointed out; and, indeed, when we recollect that the *Clionæ* are among the lower organized sponges, their intimate connection with the *Foraminifera* is what might be looked for.

I shall now close these few remarks with amended descriptions of the spicula of the British *Clionæ*, and with full descriptions of four new foreign species. The characters of the additional

* Pl. XXII, fig. 2.

† "Proceedings of the Zoological Society," April 27, 1858. Part XXVI, p. 266.

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spicula in the former are put in italics, so that the reader may see at a glance what is now added.

CLIONA CELATA. Pl. XVI, fig. 7.

Spicula pin-like, long, and stout, a little fusiform, and somewhat bent, measuring upwards of $\frac{1}{50}$th of an inch in length; the head is well defined, globular, approaching to ovate, with generally a terminal obtuse point, being placed not exactly at the end of the shaft.

C. GORGONOIDES.

Spicula pin-like, large, and stout, measuring $\frac{1}{25}$th of an inch long; the head oval, and frequently at some little distance from the extremity; from thence the shaft gradually tapers to the other or pointed end, and is usually much bent, particularly towards the head, and sometimes the pointed extremity is a little recurved.

This is a critical species, and is probably a mere variety of *C. celata*.

C. NORTHUMBRICA. Pl. XVI, fig. 1.

Spicula of three kinds: the first much the largest, measuring $\frac{1}{17}$th of an inch in length, is pin-like, straight, sharp pointed, with the head large, round, and terminal: the second kind is fusiform, scarcely more than one-fourth the length of the first, rather stout, much and suddenly bent in the centre, with both ends sharply pointed, and when viewed through the $\frac{1}{8}$th of an inch object glass is seen to be minutely spinous: *the third form very minute, being not more than the* $\frac{1}{1800}$*th of an inch long; it is cylindrical, bent sharply in the centre, and apparently smooth under the* $\frac{1}{8}$*th of an inch object glass, though occasionally there are slight indications of spines; the extremities are recurved, slightly enlarged, and rounded.*

The second and third forms are more numerous than the first, which is most abundant in the papillæ.

When dry the sponge is of a pale, clear ochreous-yellow colour.

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Since the publication of my former paper a few additional specimens have occurred on the Northumberland coast, and one in an oyster shell, probably from Scotland.

C. VASTIFICA. Pl. XVI, fig. 2.

Spicula of three kinds: the first pin-like, $\frac{1}{87}$th of an inch in length, straight, rather slender, and diminishing imperceptibly to a very fine point at one end, the other terminating in a perfectly globular head: the second kind is about one-third the length of the first, and is much thinner; it is stoutish in the centre, where it rather suddenly bends a little, and from thence tapers gradually towards the ends, which are sharply pointed; it is throughout minutely spined, but in some instances the spines are sufficiently strong to be observed with the $\frac{1}{4}$th of an inch object glass: *the third form is $\frac{1}{2100}$th of an inch long, cylindrical, irregularly bent or angulated once or twice, occasionally three times, having a central angle, and is strongly spined; the extremities are obtuse.*

Several specimens have recently occurred in oyster shells, but the locality is not known. When dry the sponge is of a yellowish-white colour. There are both large and small papillæ in this species; the former are three times the size of the latter, and are scattered at wide intervals amidst the others.

C. CORALLINOIDES. Pl. XVI, fig. 3.

Spicula of three kinds: the first, $\frac{1}{70}$th of an inch long, is pin-like, slender, generally bent in the centre, tapering gradually to a sharp point at one end, and at the other furnished with a well-defined, elliptical head: the second kind is scarcely one-third the length of the first; it is fusiform, very delicate, and suddenly bent in the centre, and when observed under the $\frac{1}{4}$th of an inch object glass is seen to be minutely spined; the extremities are sharply pointed: *the third form is minute, being only $\frac{1}{2000}$th of an inch long; it is spinous, with the extremities obtuse, and is generally zigzagged, having three angles, one being in the centre.*

A year or two ago, Mr. H. T. Mennell obtained, at the Isle

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of Wight, a specimen of this species in a valve of *Pecten maximus*. The dried sponge is of a brown colour.

C. GRACILIS. Pl. XVI, fig. 4.

Spicula of three kinds: the first pin-like, about $\frac{1}{77}$th of an inch long, generally a little bent, stout, and inclining to fusiform, with the pointed end gradually tapering; head rounded, somewhat elliptical, and merging imperceptibly into the shaft: the second kind is fusiform, one-third the length of the first, less stout, and gradually bent in the centre, it is minutely spined, and has the extremities sharply pointed: *the third form is about* $\frac{1}{1000}$*th of an inch long, and is usually zigzagged so as to form four or five angles; it is most minutely spined, and has the extremities rounded and recurved.*

When dry the sponge is of a yellowish-brown colour.

C. HOWSEI. Pl. XVI, fig. 5.

Spicula of three kinds: the first pin-like, about $\frac{1}{1000}$th of an inch long, very delicate, generally straight, with the head broadly ovate, short, well marked, terminal, and having the narrow end at the extremity, and sometimes a little prolonged: the second form is abundant and generally somewhat longer than the first, equally slender and mostly slightly bent, and gradually diminishes to a fine point at one extremity; the other has usually two heads, one terminal or nearly so, the second about one-third down the shaft; the terminal head is frequently wanting: *the third form is about* $\frac{1}{500}$*th of an inch long, rather stout, cylindrical, usually irregularly bent or angulated, and strongly spined, with the extremities obtuse.*

A few additional specimens have occurred on the Northumberland coast. The sponge when dry is of a pale yellow-ochre colour.

C. ALDERI.

Spicula of two kinds: the first pin-like, $\frac{1}{118}$th of an inch long, moderately thick, slightly bent, with a small head near one end, and tapering to the other extremity: the second form is scarcely

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shorter than the first, and has one end truncate, the other pointed, and is decidedly bent in the centre.

Sponge in a dried state of a yellowish-brown colour.

C. LOBATA. Pl. XVI, fig. 6.

Spicula of two kinds: the first $\frac{1}{100}$th of an inch long, not very slender, mostly a little bent, and brought gradually to a sharp point at one end; the other with an irregularly rounded head, sometimes slightly elliptical, and generally not exactly terminal: *the second kind, which is $\frac{1}{500}$th of an inch long, is cylindrical, rather stout, arched, and zigzagged, being six or seven times angulated, it is strongly spined, particularly at the angles; the extremities are obtuse.*

I am indebted to Mr. Charles Adamson, of Newcastle-on-Tyne, for the second specimen I have seen of this very distinct species. It is in the shell of an oyster obtained from the rocks on the west coast of Scotland. The dried sponge is of a dark snuff colour.

After a careful perusal of the above descriptions of the spicula few naturalists, I believe, will doubt the existence of more than one species of British excavating sponge.

The foreign species, which are undoubtedly very numerous, exhibit a considerable variety of spicula, though the prevailing forms are similar to those found in the British species. A few have only the pin-like kind—in this respect resembling *C. celata*; but far the greater number have either two or three kinds as in *C. lobata* and *C. Northumbrica*. The following descriptions are of four well-marked foreign species that have recently come under my notice.

C. vermifera. Pl. XVII, fig. 2.

Sponge when dry of a pale yellow-ochre colour; branches crowded and confused, composed of a series of irregular, elongated lobes, about $\frac{3}{10}$ths of an inch wide, which communicate with each other by constricted stems: papillæ not numerous, varying in size, the largest about $\frac{1}{12}$th of an inch wide. Spicula of two kinds: one, $\frac{1}{100}$th of an inch long, is pin-like, unusually stout, mostly a little bent, with the head terminal, broadly ovate,

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the wide extremity in connection with the shaft: the other form, which is scarcely one-fourth the length of the pin-like kind, is rather stout, cylindrical, arched, worm-like, undulated frequently three or four times, with the extremities obtuse: both kinds are numerous.

Two specimens of this well-marked species have occurred, both in a species of *Chama*, in my cabinet. The spicula are very characteristic: I have met with no other species which has the undulated or worm-like kind, and the stout shaft and broadly ovate head of the pin-like form are very striking. The surface of the excavations is strongly shagreened and exhibits a few scattered punctures.

C. mazatlanensis. Pl. XVII, fig. 1.

Sponge when dried of a soiled brown or pale drab colour, made up of a vast number of minute lobes about $\frac{1}{10}$th of an inch wide, irregularly rounded, united by very short constricted stems, and so crowded that the mode of branching is perceptible only at the margin of growth, where it is seen to be dichotomous, the terminal twigs being rather short, delicate, and obtuse: papillæ very numerous and minute, distributed without apparent order, $\frac{1}{30}$th of an inch wide; there are a few larger ones scattered amidst the others and about three times their size. Spicula of three kinds: the first is pin-like, $\frac{1}{110}$th of an inch long, with the shaft straight, delicate, and gradually tapering to a fine point at one end, the other exactly terminated by a large oval head, within which a cavity is distinctly seen: the second kind is fusiform, about half the length of the former, most minutely spined, pretty regularly arched, and with both ends sharply pointed: the third form is quite minute, not more than $\frac{1}{1800}$th of an inch long, cylindrical, sharply bent in the centre, roughened, or minutely spined, and with the extremities obtuse.

I have seen but one specimen of this species; it has over-run the entire surface of a *Purpura*, from Mazatlan, presented to the Newcastle Museum by Dr. P. P. Carpenter. The surface of the burrow is strongly shagreened.

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C. globulifera. Pl. XVII, fig. 2.

Sponge of a pale clear yellow colour when dry, composed of numerous globules or rounded lobes about one-fifth of an inch wide, united by short, cylindrical more or less constricted stems, and so crowded that the usual dendritic character is scarcely discernible; the terminal twigs are excessively short, and there are very few spine-like processes: papillæ few and large, measuring sometimes as much as $\frac{1}{20}$ths of an inch in diameter. Spicula pin-like, $\frac{1}{80}$th of an inch long, usually straight, occasionally a little bent, tapering gradually to the pointed extremity; the head oval, mostly placed a considerable way from the end, which is rounded; frequently the head is almost obsolete, sometimes is entirely wanting, and two heads are not by any means uncommon, one placed a little below the other.

A finely developed specimen of this species has penetrated the shell of *Spondylus gæderopus*, from the Mediterranean. It is allied to *C. celata* as is evinced by their being only one kind of spiculum, and that pin-like. The form of this organ is however sufficiently characteristic; but perhaps the colour of the sponge, the delicacy of its texture, and the lobulated mode of its growth, are the best distinguishing features.

C. Carpenteri. Pl. XVII, fig. 4.

Sponge when dry of a pale yellowish colour, formed of numerous, crowded, angulated lobes, scarcely $\frac{3}{20}$ths of an inch wide, each united to its neighbours by two or three short, much constricted, cylindrical stems: papillæ about $\frac{1}{20}$th of an inch in diameter, not very numerous, varying little in size, and scattered without apparent order. Spicula of three kinds: the first pin-like, $\frac{1}{150}$th of an inch long, straight, slender, rarely a little bent, with the head distinct, perfectly globular, and exactly terminal: the second kind, which is half the length of the first, is fusiform, unusually stout, with occasionally an indistinct narrow nodule in the centre, where it is suddenly bent; the extremities are very sharply pointed: the third form is very minute, being only $\frac{1}{200}$th of an inch long; it is usually straight, slightly fusiform,

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occasionally a little bent, and strongly spined; with the extremities obtuse.

Only one specimen of this species has been obtained; it occurs in the shell of a *Serpula* adhering to a *Chama*, from Mazatlan, presented to the Newcastle Museum by Dr. P. P. Carpenter.

EXPLANATION OF PLATES.

PLATE XVI.

Fig. 1. Spicula of *Cliona Northumbrica:* a, pin-like spicula; b, fusiform ditto; c, the minute or third form of ditto.
Fig. 2. The minute or third form of spicula of *C. vastifica.*
Fig. 3. The minute or third form of spicula of *C. corallinoides.*
Fig. 4. Ditto ditto of *C. gracilis.*
Fig. 5. Ditto ditto of *C. Howsei.*
Fig. 6. Ditto or second form of spicula of *C. lobata.*
Fig. 7. Spicula of *C. celata.*
Fig. 8. A few of the cells of *Orbitoides Fosteri* from Dr. Carpenter's figure after Ehrenberg; a, cell, next primordial cell; b, b, stolons or stems uniting the cells.
Fig. 9. A portion of an undescribed *Cliona* immersed in the shell of *Pecten magellanicus:* a, a, lobes of the sponge corresponding to the cells in fig. 8; b, b, stolons or stems.

PLATE XVII.

Fig. 1. Spicula of *C. mazatlanensis:* a, pin-like spicula; b, fusiform ditto; c, c, minute or third form of ditto.
Fig. 2. Spicula of *C. vermifera*: a, pin-like specula; b, b, the second or worm-like ditto.
Fig. 3. Ditto of *C. globulifera.*
Fig. 4. Ditto of *C. Carpenteri:* a, a, pin-like spicula; b, fusiform ditto; c, c, the third or minute form of ditto.

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XXXII.—*A Monograph of the British Entomostraca belonging to the Families Bosminidæ, Macrothricidæ, and Lynceidæ.* By the Rev. A. M. NORMAN, M.A., AND G. S. BRADY, M.R.C.S., C.M.Z.S. (Plates XVIII–XXIII.)

A WIDE field of research lies open to the British naturalist, in a more careful examination than has hitherto been made, of the smaller Crustacea inhabiting our seas, and the inland waters of our ponds, tarns, and lakes. Our own investigations have been most amply repaid by the constantly recurring pleasure afforded by the discovery of some fresh form—often one little expected—the representative of some genus which presents us with an entirely new type of structure. In the present paper we propose to describe the Entomostraca belonging to three very interesting families—the Bosminidæ, the Macrothricidæ,* and the Lynceidæ. Since the publication of Dr. Baird's "Natural History of the British Entomostraca," in 1850, many valuable memoirs and works, which throw light upon the little animals we are about to describe, have been published on the Continent. S. Fischer, Lilljeborg, Leydig, Schoedler, and G. O. Sars, have all contributed their quota of information: and yet some of these authors have, as regards synonymy, added to confusion by their works rather than cleared it up. In Leydig's account of the Lynceidæ hardly any of the species described have the right names assigned to them, and on the other hand, Schoedler appears to have laid down for himself a rule, that if two persons had described animals under different names those animals must be distinct, and his "Neue Beitrage der Naturgeschichte der Cladoceren" thus presents us with an endless multiplication of species. We have taken great pains in the following pages to clear up the present confused synonymy of the species: we cannot expect to have been in all cases successful, but any want of accuracy in this respect will certainly not be attributable to want of care. We have, however, confined our references to such memoirs as have been

* Sars' name for this Family "Lyncodaphnidæ," not being derived from the typical genus of the Family, in accordance with the usually received rules of nomenclature, we have substituted for it that here employed.

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published since Dr. Baird's work, except in cases where it seemed necessary, either for the purpose of correcting some mistake or of showing the precedence of some name, to indicate an earlier authority who has noticed the species.

By far the most valuable papers which have recently been published on the Cladocera are those of G. O. Sars. The writings of this author are in all cases marked by evidences of the greatest care and the closest accuracy of details. His general arrangement of the Sub-order, as given by him in the first part of his "Norges Ferskvandskrebsdyr," is far more satisfactory than any that has preceded it; and it has therefore been followed by us in this memoir.

Of the thirty-three species of Cladocera here described, only fifteen will be found recorded as British in Dr. Baird's work; the number of our species has thus been more than doubled. No less than twenty-eight out of the thirty-three species have been found by us within the confines of the Counties of Northumberland and Durham. The remaining five which have not as yet been observed within this district are *Macrothrix rosea*, Jurine; *Lathonura rectirostris*, Müller; *Bosmina Coregoni*, Baird; *Anchistropus emarginatus*, G. O. Sars; and *Lynceus reticulatus*, Baird. The first of these has been found in Lochmaben Castle Loch, Dumfriesshire, and in some of the small lakes of Connemara; the second is only known in our Islands to inhabit Lough Bollard, Connemara; the third only Lochmaben; the fourth has only been observed in the Paisley Canal, near Glasgow; while the last has apparently not been noticed since it was first described by Dr. Baird.

Sub-order. CLADOCERA.

Div. CALYPTOMERA, *G. O. Sars.*

Body enclosed in and completely covered by a vaulted shell, which forms two valves below, within which the body moves freely. Mandibles truncate at the inferior extremity. Maxillæ distinct, movable, furnished with geniculated setæ or spines. All the thoracic somites distinguishable from each other and double, united by longitudinal and transverse sutures.

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Tribe. ANOMOPODA. *G. O. Sars.*

Feet differing widely from each other in structure, the anterior more or less prehensile, without any branchial lamina attached to them. Posterior antennæ two-branched; branches sub-equal, cylindrical, slender, furnished with a few setæ.

Family. BOSMINIDÆ.

Anterior antennæ continuous with the rostrum, immovable in the female, multiarticulate, having auditory cilia attached to the inner side at some distance from the extremity. Posterior antennæ one branch three, the other four-jointed. Feet five pairs, with the rudiments of a sixth pair, separated from each other by nearly equal intervals; a branchial lamina, which is generally large, and extended in a longitudinal direction, attached to the last feet. Intestinal canal simple, without either loop or cœcal appendages, but wide and flexuous near the commencement.

Genus. BOSMINA. *Baird.*

Carapace truncate posteriorly, and having the postero-ventral angles of each valve generally produced downwards into a conspicuous, spine-like process. Head rather small, having a more or less produced rostrum, with rounded extremity, to which are affixed, immovably in the female, the anterior antennæ. These antennæ are long and very slender, being equal to from one-third to the entire animal in length, multiarticulate, giving forth at some distance from their base a spine-formed process on the inner side, at the origin of which is a group of tentaculiform setæ. Posterior antennæ two-branched, one branch three-jointed, and bearing five geniculate and ciliated setæ; the other four-jointed, furnished with four such setæ. Eye of considerable size; no accompanying eye-spot. Abdomen small, superior margin at the most only furnished with fine hair-like spines, chiefly at the supero-posteal angle; termination truncate, emarginate, terminal claws springing from a produced process, of considerable size, furnished with a row of small spines on the basal portion of the

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inner edge. Intestine simple, vent terminal, immediately below the claws.

In the male the first feet are furnished with a hook as in the Lyncei; the abdomen becomes gradually narrower towards the termination instead of being abruptly truncate at the end; and the anterior antennæ are movable, being articulated at the point of junction with the head.

1. Bosmina longirostris, (*Müller.*) Pl. XXII, fig. 4.

1848. *Eunica longirostris*, Liévin. Die Branchiopoden der Danziger Gegend, p. 37. Pl. VII, figs. 8–11.
1860. *Bosmina longirostris*, Leydig. Naturges. der Daphniden, p. 205. Pl. VIII, fig. 60.
1861. *Bosmina longirostris*, G. O. Sars. Om de i Omegnen af Christi. forekom. Cladocerer, p. 11.

Head erect, not tumid above, rostrum moderately long; anterior antennæ one-third to one-half as long as the entire animal, curved, sometimes reflexed at the tips; bending outwards on each side. Postero-ventral angles of carapace produced downwards into spine-like processes of moderate length, not exceeding the length of, though much broader than, the abdominal claws. Supero-posteal angle of abdomen well rounded; margins entire, not crenated or spinous, terminal claws very slightly ciliated. Surface of shell punctated, and reticulate; reticulation generally faint, often indistinguishable in mounted specimens. Length, $\frac{1}{24}$th of an inch.

Frequent in lakes and other clear water.

We have felt great doubts whether all the Bosminæ which we have met with (except the very distinct *B. Coregoni*), should be assigned to one, or whether they constitute two or more species. Scarcely two mountings are exactly alike. Specimens from different localities vary greatly in size—in proportions of length and breadth—in the amount of sculpture of the carapace—in the exact length of the anterior antennæ, &c., &c.; yet we are unable at present to find good specific characters. The two more marked forms we have in this paper distinguished by Leydig's

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names, *longirostris* and *longispina*, believing that these at any rate must be regarded as species; and yet it has not been without much hesitation that we have ventured to consider them distinct from each other.

2. Bosmina longispina, *Leydig*. Pl. XXII, figs. 1, 2.

1850. (?) *Bosmina longirostris*, Baird. British Entomostraca, p. 105. Pl. XV, fig. 3.

1860. *Bosmina longispina*, Leydig. Naturges. der Daphniden, p. 207. Pl. VIII, fig. 62.

1861. *Bosmina obtusirostris*, G. O. Sars. Om de i Omegnen af Christi. forekom. Cladocerer, p. 11.

Head depressed, tumid above, being elevated on the crown, rostrum short, obtuse; anterior antennæ of moderate length, nearly straight, neither much curved nor bent downwards. Postero-ventral angles of carapace produced downwards into large and elongated spine-like processes; the lower margin of which is sometimes notched in one or two places. Surface of shell everywhere striated, the striæ being very evident on the sides of the head; antero-ventral portion reticulated. Superior margin of abdomen mostly about eight times crenulated towards the posterior extremity, and bearing one or two minute curved setæ; supero-posteal angle mostly acute. Abdominal claws having six to eight small spines on the edge, which increase in length from before backwards. Length, $\frac{1}{44}$rd to $\frac{1}{33}$th of an inch.

The figure in the *Natural History of the British Entomostraca* seems, from the length of the infero-posteal produced angles of the valves, to be intended to represent this form rather than that last described. Among the specimens collected at the Humbles, we found numerous males. These are smaller, and longer in proportion to their breadth than the females; the rostrum is blunter, and the anterior antennæ, which are longer and more slender than the same organs in the female, are distinctly articulated to it; the first feet are furnished with a large, hook-shaped process, the extremity of which is blunt; and the abdomen

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gradually tapers to the claws instead of having its termination widely truncate.

Tarns on the Humbles, Northumberland; Mickle Fell, Yorkshire; Loch Skene, Dumfriesshire; Windermere; and Lough Bollard, Connemara (G. S. B.); Stornoway, in Lewis (A. M. N.)

3. Bosmina Coregoni, *Baird*. Pl. XXII, fig. 3.

1834. "*Food of the Vendace.*" Knox Trans. Roy. Soc., Edinb., Vol. XII. Part II. Pl. II, figs. 3–5.

1857. *Bosmina Coregoni*, Baird. Edinburgh New Philos. Journ., Vol. VI, p. 24.

1857. *Bosmina Coregoni*, A. White. Pop. Hist. Brit. Crust., p. 273.

1861. *Bosmina Lilljeborgii*, G. O. Sars. Om de i Omegnen af Christ. forekom. Clad. (Andet. Bidrag.), p. 30.

Head flat, the dorsal line scarcely at all declining until the greatest breadth of the carapace is reached. Carapace excessively wide, in the adult female the width anteriorly exceeds the total length of the animal; narrow and truncate at the posterior extremity; ventral margin nearly straight, dorsal excessively tumid; infero-posteal angle well marked, but without any trace of spine formed projections; surface of valves reticulated, reticulations mostly sexangular, the sculpturing more evident on the infero-anteal portion of shell. Rostrum of moderate length; anterior antennæ of very remarkable length, as long as the entire carapace, composed of about twenty articulations, nearly straight, and projected at a very considerable angle from the ventral margin. Posterior antennæ short. Length, $\frac{1}{75}$th of an inch.

The only known British locality for this curious little species is Lochmaben Castle Loch, Dumfriesshire, where, together with *Macrothrix rosea*, &c., it forms an important item in the food of the Vendace (*Coregonus albula*, Lin.). It has also been described by Sars, from Sweden; at least, we can scarcely doubt that his *C. Lilljeborgii* is the same species; his description exactly agreeing with *C. Coregoni*, except that the surface of the shell is said to be striated.

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Family. MACROTHRICIDÆ.

Anterior antennæ one-jointed, articulated to the extremity of the rostrum, and movable in both sexes; furnished with auditory cilia at their extremity, these cilia being usually large and tentaculiform. Posterior antennæ two-branched, branches sub-equal, slender, and cylindrical; one branch three, the other four-jointed. Feet five pairs, with sometimes the rudiment of a sixth pair, separated by a nearly equal interval from each other, the last provided with a branchial lamella, which is generally large and extended longitudinally. Intestine either simple or convoluted.

Genus. MACROTHRIX, *Baird.*

Carapace ovate, more or less produced centrally behind; ventral margin serrulated and ciliated, cilia simple. Anterior antennæ large, conspicuous, one-jointed, cylindrical, or strap-shaped, attached to the extremity of the rostrum. Posterior antennæ having the four-jointed ramus furnished with four, and the three-jointed with five setæ, the lowermost seta of the latter geniculate like the other setæ, but very long, and differing from them in structure. A black eye-spot situated between the eye and the end of the rostrum. Abdomen very deep, edged with hair-like spines, and terminating in two very small simple claws. Intestinal canal perfectly simple. Inhabitants of lakes and other clear pieces of water.

1. Macrothrix laticornis, (*Jurine.*) Pl. XXIII, figs. 4, 5.

1820. *Monoculus laticornis*, Jurine. Histoire des Monocles, p. 151. Pl. XV, figs. 6, 7.

1850. *Macrothrix laticornis*, Baird. British Entomostraca, p. 103. Pl. XV, fig. 2.

1851. *Macrothrix curvirostris*, S. Fischer. Mem. presentés a l'Academie Imp. des Sciences de St. Petersbourg, par divers Savants. Vol. VI, p. 184. Pl. VII, figs. 7–10.

1853. *Macrothrix laticornis*, Lilljeborg. De Crust. ex Ord. tribus. Clad. Ost. et Copep., p. 50. Pl. III, figs. 8, 9.

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1860. *Macrothrix laticornis*, Leydig. Naturges. der Daphniden, p. 193.

Carapace ovate, most produced in the middle of the posterior extremity; dorsal margin having a slight sinuosity about the middle, after which it sweeps with a well-arched curve gradually to the central point at the posterior extremity, where the division of the carapace commences; the dorsal margin is finely serrulated throughout the whole of the posterior half; ventral margin well arched, fringed with long cilia (except on the hinder portion), gradually curving to meet the dorsal margin at the central posterior point, so that there is no trace of any infero-posteal angle. Head somewhat flattened on the summit, truncate inferiorly; eye very large; eye-spot close to the extremity of the rostrum; anterior antennæ largely developed, dependent, strap-formed, gradually widening from the base to the extremity; distal half of anterior edge with a few notches; extremity truncate, with a piece as it were cut out of the posterior corner, to the truncated portion of the apex are attached a number of long tentacular setæ, and a little tuft of fine hairs occupies the notch just described. Abdomen very deep, sweeping with a bold arch from the origin of the two long geniculated setæ to the terminal claws, edge denticulate throughout, with a small bunch of fine hairs by the vent; claws very small. Length, $\frac{1}{15}$th of an inch.

Found near London, by Dr. Baird; at Belfast, by the late Mr. W. Thompson; at Fardingslake, and in the Glebe Engine Pond, Sunderland, county of Durham; in the East Lake, at Belsay, Northumberland, and North Shaws Loch, Selkirkshire, by G. S. B. Its range is known to extend in Europe from the neighbourhood of Geneva in the south, to Norway and Sweden in the north, and Russia in the east.

2. MACROTHRIX HIRSUTICORNIS, n. sp. Pl. XXIII, figs. 6, 7.

Carapace in general form resembling the last, but broader, the dorsal margin is smooth throughout (the serrulation of the edge, which forms so marked a character in *M. laticornis*, being altogether absent). The eye-spot is large and not so near the extremity of the rostrum, but midway between it and the eye. The

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posterior antennæ have their base of moderate thickness; and the long seta of the three-jointed ramus is ciliated on one side; the remaining setæ have a spine at the end of their first joint. The most marked character, however, consists in the anterior antennæ, which are somewhat club-shaped, sub-truncated, rounded at the extremity, and instead of having the long tentaculiform setæ of *M. laticornis*, are only furnished with fine hairs distributed round their extremity; but arranged here and there, throughout the length of the antennæ, are tufts or semi-verticils of fine hairs, these are more evident on the anterior margin, but are present also on the sides; on the posterior margin there are no hairs except near the distal extremity. Abdomen of the same form as that of the last species; the margin, instead of being denticulate, is furnished with hairs which are very minute, except towards the small terminal claws, where they become much larger and more conspicuous. Length, $\frac{1}{15}$th of an inch, this being by far the largest of the three species of the genus.

The only locality at present known for this new species is a slowly-running stream at Ashburn, Sunderland, where it was found by G. S. B., in 1864.

3. Macrothrix rosea, (*Jurine.*) Pl. XXIII, figs. 1–3.

1820. *Monoculus roseus*, Jurine. Histoire des Monocles, p. 151. Pl. XV, figs. 4, 5.

1850. *Macrothrix roseus*, Baird. Brit. Entomostraca, p. 104.

1853. *Macrothrix rosea*, Lilljeborg. De Crust. ex Ord. tribus Cladoc. Ostrac. et Copep., p. 47. Pl. IV, figs. 1, 2; and Pl. V, fig. 1.

1860. *Macrothrix roseus*, Leydig. Naturges. der Daphniden, p. 192.

Carapace narrower than in the last two species; the central point at the posterior extremity more produced; dorsal margin not serrulate, but towards the posterior extremity furnished with a few minute distant spines; ventral margin denticulate and ciliate, cilia very long. Anterior antennæ long and narrow, not

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widening towards the extremity, and of nearly equal breadth throughout, having a small knob-like swelling on the posterior margin close to the base; and furnished with a few small setæ at the distal extremity and on the anterior margin, where they are situated in seven to nine little notches. The peduncle of the posterior antennæ of moderate dimensions, the seta of the first joint of the three-branched ramus very long and unusually thick, and furnished on one edge with a few conspicuous spines; the remaining setæ of both rami have a spine at the termination of their basal portion. Abdomen edged with spine-like hairs, more conspicuous close to the abdominal setæ, thence gradually becoming more minute posteriorly, until they are almost entirely absent; but near the claws they again re-appear of much greater length. Eye-spot small, situated close to the extremity of the rostrum. Length, $\frac{1}{12}$th of an inch.

Found in Lochmaben Loch, Dumfriesshire, by Mr. W. Yarrell; and in Loughs Cregduff, Bollard, Doon, and Nawheelan, Connemara, by G. S. B. Abroad it is known in the neighbourhood of Geneva, in Sweden, and in Germany.

Genus. DREPANOTHRIX, *G. O. Sars*.

Carapace nearly round, not produced centrally behind, dorsal margin having a distinct sinus at the junction of the thorax and head, and posterior to this furnished with a large thorn-like process, ventral margin serrulate and ciliate, cilia simple. Anterior antennæ large, conspicuous, trunk-like, dependant from the extremity of the rostrum. Posterior antennæ having the four-jointed ramus furnished with four, and the three-jointed ramus with five setæ; the lowermost seta of the latter not geniculated like the others, simple, falciform, spined on one edge. Eye-spot large, quadrangular. Abdomen short, deep, edged with spines, terminal claws very small. Intestinal canal forming a very large loop in the middle of the thorax. An inhabitant chiefly of upland lakes.

It will be observed that this genus differs from *Macrothrix* chiefly in having a large convolution in the intestinal canal, and

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in the non-geniculated structure of the first seta of the three-jointed ramus of the posterior antennæ.

DREPANOTHRIX HAMATA, *G. O. Sars.* Pl. XXII, figs. 5–7.

1861. *Drepanothrix sentigera*, G. O. Sars. Om de i omegnen af Christiania forekommende Cladocerer, p. 14.

1862. *Drepanothrix hamata*, G. O. Sars. Om de i omegnen af Christ. forekom. Clad. *Andet Bidrag.*, p. 51.

Carapace showing a distinct separation of the head from the thorax, marked by a sinuation at their junction on the dorsal margin; form of the hinder portion (as apart from the head) nearly round; a remarkable large thorn-like process (which is however very variable in size and sometimes almost obsolete) projecting from the middle of the dorsal margin, both margins well arched; valves united as far as the middle of the posterior extremity; ventral margin serrulated, and fringed with long, simple setæ; surface both of head and valves regularly and distinctly punctated and reticulated, reticulations sexangular. Head large, erect, rostrum pronounced; eye large, eye-spot half the size of the eye, quadrangular; anterior antennæ dependent from the extremity of the rostrum, large, gently curved, distal half of the anterior margin having a series of deep notches, about six in number, extremity truncate and furnished with tentaculiform cilia; posterior antennæ having the peduncle of moderate size, crenated at the base, and with a long acute spine on the upper side at its extremity; four-branched ramus furnished with a spine at the extremity of the second articulation, and terminating in three geniculate plumose setæ and a spine; three-jointed ramus, having the seta of the basal joint flattened, curved, not jointed, and margined towards the end on one side with spines, second joint furnished with one (longer than the others) and ultimate joint with three geniculate plumose setæ and a spine. The labrum is produced downwards in the form of a large, thickened angular process. Abdomen small but very deep, not more than twice as long as broad, edged with spines, and having oblique rows of very delicate setiform spines on the sides; extremity wide, emarginate; claws small, curved,

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furnished with a spine at the base. The intestinal canal is coiled upon itself in a large loop in the thorax. Length, $\frac{1}{42}$nd of an inch.

G. O. Sars discovered this species in Sweden, in 1861. In 1864 it was met with by A. M. N. in Darden Lough, Northumberland, and shortly afterwards by G. S. B. in several other localities, viz., Lochend Loch, Kirkcudbrightshire; Loch Skene, and Lochmaben, Dumfriesshire; Easedale Tarn and Rydal Lake, Westmorland, and Lough Bollard, Connemara.

Genus. LATHONURA, *Lilljeborg*.

Carapace obovate, not produced centrally behind, dorsal margin having a sinus at the junction of the thorax with the head, ventral margin furnished with peculiar, flattened spear-shaped plates attached to the edge. Anterior antennæ elongated, cylindrical, dependent from the extremity of the rostrum. Posterior antennæ having both rami furnished with five geniculate plumose setæ, the basal seta of the three-jointed ramus not differing from the others in structure. Eye-spot very minute, a mere speck. Abdomen very small, generally hidden between the feet, abdominal setæ very long, not geniculate, but multiarticulate on the distal portion. Intestinal canal simple. Living in clear lakes.

Lathonura rectirostris, (*Müller*.) Pl. XXIII, figs. 8–12.

1785. *Daphnia rectirostris*, O. F. Müller. Entomostraca, p. 92. Tab. XII, fig. 1–3.

1835. *Pasithea rectirostris*, Koch. Deutschlands Crustaceen, Myriapoden, &c., p. 35. Pl. XXIV.

1844. *Daphnia brachyura*, Zaddach. Synopseos Crustaceorum Prussicorum Prodromus, p. 23.

1848. *Pasithea brachyura*, Liévin. Die Branchiopoden der Danziger Gegend., p. 42. Pl. XI, figs. 1–3.

1851. *Daphnia mystacina*, S. Fischer. Mem. presentés a l' Academie de St. Petersbourg. Vol. VI, p. 174. Pl. IV, figs. 1–8.

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1853. *Lathonura rectirostris*, Lilljeborg. De Crust. ex Ord. tribus, Clad. Ostrac. et Copep., p. 57. Pl. IV, figs. 8–11; Pl. VI, fig. 2; and Pl. XXIII, figs. 12, 13.

1860. *Pasithea lacustris* and *rectirostris*, Leydig. Naturges. der Daphniden, p 203. Pl. VII, fig. 57; and p. 200.

Carapace obovate, dorsal margin sinuated at the junction of the head and thorax, posteally well arched, valves of carapace united as far as the middle of the posterior extremity, beyond which they are extended downwards in a semicircular form, so that the ventral side of the carapace is the longer, and the infero-posteal angle is completely rounded off; ventral margin nearly straight in its central portion, having the anterior two-thirds of its length fimbriated with a series of curious flattened, lanceolate plates, of considerable size; posterior third furnished with fine short cilia, the line of separation between the fimbriating plates and the cilia is sharply defined. Head very large, rostrum scarcely any; eye small, near the summit of the head; eye-spot very minute, situated at a considerable distance from the eye, and close to the origin of the anterior antennæ; anterior antennæ long, narrow, cylindrical, of nearly equal width throughout, edges slightly notched, one conspicuous spine-like seta on the anterior and a second on the posterior margin; distal extremity truncate, furnished with tentaculiform setæ; posterior antennæ having the peduncle long and slender, crenated at the base; each ramus furnished with five setæ, and a terminal spine; the setæ all alike, short, geniculate, and plumose, and differing from the usual antennal setæ of the family in that the basal portion is much thicker than the terminal portion; the lowermost seta of the three-jointed ramus in no way differs from the rest; but two of the terminal setæ of each ramus have their basal portion (instead of being plumose) furnished on one edge with small spines. Abdomen of very peculiar form, very small, and consisting chiefly of a mammæform process produced backwards and downwards, to the extremity of which are attached the abdominal setæ, which are of great size and length, sparingly plumose, not geniculate, but having their extremity multiarticulate; terminal claws very small; the

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abdomen is usually so hidden by the feet that it is difficult to detect its true form and character. Length, $\frac{1}{20}$th of an inch.

The peculiar plates attached to the ventral margin of *Lathonura rectirostris*, instead of the usual setæ or spines, at once serve to distinguish this species from all other Entomostraca with which we are acquainted. The abdominal setæ are very easily broken off; and a specimen in which they have been thus abraded is figured by Leydig as the type of his *Pasithea lacustris*.

Found by G. S. B. in Lough Bollard, Connemara. It has a continental range extending through Russia, Germany, Norway, and Sweden.

Genus. ACANTHOLEBERIS, *Lilljeborg*.

Carapace somewhat oblong, truncate posteriorly, ventral margin edged with long setæ, which posteriorly become greatly developed, and are plumose. Anterior antennæ strap-shaped, widening to the truncated extremity, large, and conspicuous, porrected from the front of the head. Posterior antennæ having the three-jointed ramus furnished with five setæ, and the four-jointed ramus bearing only three setæ at the termination; lowest seta of the three-jointed ramus the longest, and differing from the rest in structure. Eye-spot small. Abdomen large, deep, strongly spined on the edge, terminal claws of considerable size. Intestinal canal simple at first, but forming a loop near the anus. Labrum with a conspicuous spine-formed process in front.

Acantholeberis curvirostris, (*Müller*.)

Acantholeberis curvirostris, Norman. Ann. Nat. Hist., Ser. 3, Vol. XI (1863), Pl. XI, figs. 1–5; and Trans. Tyneside Nat. Field Club, Vol. VI, p. 53. Pl. VI, figs. 1–5.

This species has already been fully described and figured in our local Transactions by one of the authors of the present paper. It is only necessary therefore to refer the reader to the sixth volume of the Transactions of the Tyneside Naturalists' Field Club.

Acantholeberis curvirostris delights in peaty water, and would appear to be far from rare on the moors of the British Islands.

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It has been found by G. S. B. in the Loughs at Knarsdale, and in Crag Lough, Northumberland; in Clearburn Loch, and a pool on Helmoor, Selkirkshire; on Hilton Fell, Westmorland; and in bog pools in Connemara: by A. M. N. in Chartners, Aird, and Darden Loughs, and in bog pools near Winters Stob, Northumberland; and by Mr. D. Robertson in a tarn in the Isle of Cumbrae, N.B. On the Continent it is known in Germany and Scandinavia.

Genus. ILYOCRYPTUS, *G. O. Sars.*

Carapace somewhat ovate, wider behind than in front, valves separated from each other throughout the greater part of their circumference, ventral and posterior margins fringed with long plumose setæ; towards the postero-ventral angle these setæ gradually assume a spine-like character, and themselves bear smaller spines on one side. Anterior antennæ cylindrical, of nearly equal diameter throughout their length; the head is much elevated, and the origin of the anterior antennæ is considerably posterior to the position of the eye. Posterior antennæ consisting of an immensely developed and very muscular peduncle, and two short rami; the four-jointed ramus furnished with three terminal, and the three-jointed with five short, geniculate, and plumose setæ; each ramus has at its termination, besides the three setæ, a long slender spine, and the second joint of the four-jointed ramus is also furnished with a similar spine. Eye very small; accompanying eye-spot also small, but large as compared with the minute eye. Abdomen very large and deep, having rows of strong marginal spines, and terminating in two largely developed and very long claws. Intestine not coiled, but dilated, and furnished with a "cylindrical cœciform appendage" (G. O. S.) near the termination. *Ilyocryptus* is unable to swim and drags itself about in the mud at the bottom of lakes and clear pieces of water.

Ilyocryptus sordidus, *Liévin.*

Acantholeberis sordidus, Norman. Ann. Nat. Hist., Ser. 3, Vol.

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XI, Pl. XI, figs. 6–9; and Trans. Tyneside Nat. Field Club, Vol. VI, p. 55. Pl. VI, figs. 6-9.

Ilyocryptus sordidus, G. O. Sars. Om de i Omegnen af Christiania forekommende Cladocerer (1861), p. 12; and Andet Bidrag. (1862), p. 34.

At the conclusion of the description of this species in a former paper, published in the Trans. Tyneside Nat. Field Club, the Rev. A. M. Norman remarked—"We have already referred to the fact that this species does not appear to embrace all the characters which are assigned to the genus *Acantholeberis*. It agrees with *A. curvirostris* in the number of setæ attached to the posterior antennæ, and also in the presence of setæ of great length at the posterior ventral angle of the carapace. It differs in the fact, that the setæ of the first two joints of the lower branch of the posterior antennæ are short, and do not differ in character from the ordinary plumose setæ of the Daphniadæ. But a more important divergence would appear to exist in the structure of the intestinal canal, which does seem to possess a loop near the excretory orifice as in *A. curvirostris;* nevertheless, a great dilatation of the canal exists in an analagous position, forming apparently a strong muscular rectum. At the same time we speak with hesitation, and our opportunities of investigating the structure of the species have not been sufficient to enable us to speak with certainty on this and other points." G. O. Sars having now established a genus for its reception that genus is here adopted; Sars has also found a second species in the Swedish lakes, which should be sought for in our Islands.

To the two localities in the neighbourhood of Sedgefield, where *I. sordidus* first occurred in Britain, and was noticed by Mr. Norman, Mr. Brady has now added a third, viz., the Eastern Lake at Belsay, Northumberland. Fischer has found the species near Moscow; Leydig and Liévin in Germany; and G. O. Sars in Sweden.

Family. LYNCEIDÆ.

Shell of the head greatly produced on each side, shield-shaped, and extending downwards to form a well marked rostrum, which

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is usually large and acute, and beneath which the anterior antennæ are wholly or partially concealed. Posterior antennæ two-branched, both branches three-jointed, Five or six pairs of feet separated from each other by nearly equal intervals, the anterior unguiculate, the posterior always furnished with large branchial laminæ directed longitudinally. Intestinal canal forming a loop, which is generally double, in the thorax, and furnished in its passage through the abdomen with a cœciform appendage.

Genus. LYNCEUS, *Müller*.

[*Chydorus*, Leach, 1819. *Alona*, *Camptocercus*, *Acroperus*, *Pleuroxus*, and *Peracantha*, Baird, 1843. *Alonella*, *Graptoleberis*, *Harporhynchus*, and *Alonopsis*, G. O. Sars, 1862, *Rhypophilus*, Schoedler, 1863.]

Head projecting in a hood-like shape over the bases of the anterior and posterior antennæ, the former of which are nearly or quite covered by it. Eye accompanied by a secondary eye-spot, which is situated between it and the end of the rostrum. Posterior antennæ two-branched, each branch consisting of three joints; one branch furnished with three, the other with four or five geniculate and ciliate setæ. Six pairs of feet; the first in the male furnished with a large hook-formed process used in seizing the female. Abdomen capable of being folded upwards upon the thorax, or of being stretched out in a line with it; terminating in two strong claws, and having more or less numerous spines articulated to the superior (i.e., dorsal) margin. Intestine forming two convolutions in its course. Anal opening on the superior margin of the abdomen, at some distance from its extremity, and anterior to the row of marginal spines.

No less than ten genera have been formed out of Lynceus, the names of which are enumerated above. When an attempt was made by Dr. Baird to subdivide the genus, unable to find any structural differences on which to base the character of the genera he described, he relied mainly on the variations in the form of the carapace. The result was unsatisfactory at the time, for genera most certainly should be established upon differences of

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structure, while variations of form more properly constitute specific character. The discovery of many intermediate species since 1843 has clearly proved, either that the genus *Lynceus*, if form of carapace alone be relied on, must be divided into almost as many genera as there are species, and that thus the process of multiplication of genera must be carried further, as has been done by G. O. Sars and Schoedler, or the several genera enumerated above must be merged in *Lynceus*, as has been done by Lilljeborg and Leydig. We believe the latter to be the right course. Lynceus is a natural group, distinguished from its allies by structural characters. If the reader will cast his eye over the synonymy of the following pages, he will at once see the difficulties under which authors have laboured in their attempts to allocate the several species in the unsatisfactory genera which have been established. We will merely here call attention to two, out of many instances, in proof of this. *Lynceus tenuicaudis* is so exactly intermediate between Alona and Camptocercus, that Schoedler at first called it *Camptocercus alonoides*, and subsequently changing his mind, dubbed it instead *Alona camptocercoides*. The poor little *Acroperus nanus* of Baird has found no resting place: while Lilljeborg and Leydig, rightly as we think, unite it with all its allies in Müller's genus *Lynceus*, Baird places it in *Acroperus*, Schoedler in *Pleuroxus*, G. O. Sars in *Alona*, and the same author in his later paper in *Alonella*.

Although however we have thought it better at the present time to unite, under the name of *Lynceus*, the species about to be described, it is not improbable that a more thorough examination of the structure of the animals than has yet been made may hereafter result in the establishment of genera upon a satisfactory basis, in which case some of the genera now suppressed might be adopted with re-defined characters.

1. Lynceus harpæ, *Baird*. Pl. XXI, fig. 1.

1835. *Lynceus harpæ*, Baird. Trans. Berw. Nat. Club, Vol. I, p. 100. Pl. II, fig. 17.

1841. *Lynceus leucocephalus*, Koch. Deutschlands Crustaceen, Myriapoden u Arachniden, p. 36. Pl. X.

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1850. *Acroperus harpæ*, Baird. Brit. Entom., p. 129. Pl. XVI, fig. 5.

1850. *Lynceus leucocephalus*, Fischer. Mem. des Sav. étrangers, St. Petersbourg, Vol. VII, p. 11. Pl. III, figs. 6–9.

1853. *Lynceus striatus*, Lilljeborg. De Crust. ex Ord. tribus Clad. Ostrac. et Copep., p. 88. Pl. VII, fig. 5.

1860. *Lynceus leucocephalus*, Leydig. Naturges. der Daphniden, p. 218. Pl. IX, figs. 64, 65.

1863. *Lynceus leucocephalus* and *harpæ*, Schoedler. Neue Beiträge zur Naturges. der Daphniden, p. 30. Pl. I, figs. 11–16; p. 32.

Carapace somewhat semicircular, wide in proportion to its length, dorsal margin well arched; posterior extremity very obliquely truncate and forming a continuous arch with the dorsal margin; ventral margin slightly concave beyond the middle, ciliated; infero-posteal angle with two or three very minute teeth; surface obliquely striated. Head scarcely depressed, hooded, rostrum short, wide, rounded at the extremity; anterior antennæ shorter than the rostrum; posterior antennæ long and slender. Eye small, eye-spot triangular, nearly as large as the eye, situated midway between it and the end of the rostrum. Abdomen of moderate length, parallel sided, distally truncate, with a decided supero-posteal angle, no spines on the margin, but a row of very delicate spines or setæ on the side of the abdomen; a little bunch of hair on the extremity of the abdomen near the origin of the claws; claws very long, slender, and nearly straight, furnished with one delicate spine near the base, and a second, very delicate and slender, springing from a little beyond the middle. Length, $\frac{1}{24}$th of an inch.

We have rejected the name of *striatus* for this species, inasmuch as Jurine's figure and description seem to accord better with the *L. elongatus* of G. O. Sars than the *L. harpæ* of Baird. In the present state of uncertainty it is advisable to drop Jurine's name altogether; hereafter, perhaps, the investigations of some carcinologist, in the neighbourhood of Geneva, may enable

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us to determine what species occurring there is most likely to have been met with by Jurine and described as his *L. striatus*.

Leydig describes and figures two species allied to *L. harpæ*—one under the name of *leucocephalus*, which is unquestionably the same as that here described; the second as *L. striatus*, which he considers to be the same as that described under the same name by Liévin.

Lynceus harpæ is common throughout the British Islands, inhabiting clear water. It is also known in Russia, Prussia, Norway, and Sweden.

2. LYNCEUS MACROURUS, *Müller*. Pl. XX, fig. 6; and Pl. XXI, fig. 2.

1776. *Lynceus macrourus*, Müller. Zool. Dan. Prodromus, 2397.

1850. *Camptocercus macrourus*, Baird. Brit. Entom., p. 128. Pl. XVI, fig 9.

1851. *Lynceus macrourus*, Fischer. Mem. des Sav. étrang. St. Petersbourg, Vol. VI, p. 160. Pl. II, figs. 1–9.

1853. *Lynceus macrourus*, Lilljeborg. De Crust. ex Ordin. tribus Clad. Ostra. et Copep. in Scania occur., p. 90. Pl. VII, figs. 2–4.

Carapace elongated, narrower behind than in front, dorsal margin gently arched, posterior margin arched; ventral margin waved, concave centrally, ciliated, having the posterior angle furnished with from two to six conspicuous tooth-like processes; surface sculptured with well-marked longitudinal waved striæ. Head erect, rostrum very short, hood-shaped, rounded at the extremity; anterior antennæ very short, shorter than the short rostrum; posterior antennæ small. Eye small; eye-spot nearly equal to it in size, situated nearer to the eye than to the extremity of the rostrum. Abdomen very long and narrow, gradually tapering from the base to the claws, wholly devoid of any trace of the usual supero-posteal angle; superior margin fringed with spines, which under a high magnifying power are seen to be serrated; terminal claws extremely long, nearly straight, furnished

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with a spine at the base, which is about one-third the length of the claw itself; claw furnished with cilia on the edge throughout two-thirds of its length. Length, $\frac{1}{20}$th of an inch.

We are indebted to Mr. D. Robertson for the male of this species, procured by him in the Paisley Canal; the carapace is somewhat narrower than that of the female, the dorsal margin being less arched; the rostrum is of slightly different form, blunter, and more rounded at the extremity; the anterior antennæ are rather larger, but do not appear to differ in structure; the clasping hook of the first feet has the bend more sudden and less rounded than is usual in the males of the genus; the abdomen has no marginal spines, and the terminal claws are distorted and doubly bent.

Lynceus macrourus is a lover of clear water, and though a local species, is not uncommon in our lakes and large pieces of water. Saddington Reservoir, Leicestershire; Crag, Greenlea, and Grindon Loughs, Northumberland; tarn near Stornoway, Lewis (A. M. N.): Alemoor and North Shaws Lochs, Selkirkshire; Lochmaben, Dumfriesshire (G. S. B.); Paisley Canal, N.B. (Mr. D. Robertson). It has a continental range throughout the north of Europe.

Schoedler, in his "*Neue Beiträge zur Naturgeschichte der Cladoceren*, Berlin, 1863," describes four species of "Camptocercus," *C. macrourus*, *C. Lilljeborgii*, *C. rectirostris*, and *C. biserratus*, but they appear to us to be nothing more than slight varieties of one species.

The species described as *Lynceus macrourus* by Leydig and Liévin is referable to *L. elongatus*, and not to the true *L. macrourus*.

3. Lynceus elongatus, (*G. O. Sars.*) Pl. XVIII, fig. 1; and Pl. XXI, fig. 2.

1820. (?) *Monoculus striatus*, Jurine. Histoire des Monocles, p. 154. Pl. XVI, fig. 1, 2.

1848. *Lynceus macrurus*, Liévin. Die Branchiopoden der Danziger Gegend, p. 41. Pl. X, fig. 1.

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1860. *Lynceus macrourus*, Leydig. Naturges. der Daph., p. 219. Pl. IX, figs. 66, 67.

1861. *Alona elongata*, G. O. Sars. Om de i Omeg. af Christ. forekom. Clad., p. 19.

1862. *Alonopsis elongata*, G. O. Sars. Om de i Omeg. af Christ. forekom. Clad. Andet Bidrag., p. 41.

1863. *Acroperus intermedius*, Schoedler. Neue Beitrage der Naturges. der Clad., p. 33.

Carapace much elongated, somewhat oblong; dorsal margin gently and moderately arched; posterior extremity obliquely truncate; ventral margin slightly arched, ciliated, a single minute tooth towards the well-rounded infero-posteal angle, where the cilia cease; surface obliquely striated, spaces between the striæ finely striated, these secondary striæ having a direction which is oblique to the course of the primary striæ. Head nearly erect, small, rostrum very short, well-rounded, hood-shaped; anterior antennæ slightly longer than the rostrum. Eye large, eye-spot nearer to the extremity of the rostrum than to the eye. Abdomen long, of moderate breadth, parallel-sided, supero-posteal angle rounded off, marginal spines about fifteen, of moderate size, extending round the posteal angle; terminal claws very long and nearly straight, bearing three secondary spines, one at the base, the second about the middle, the third a little beyond the middle of the claw; the space between the first and second of these spines is also pectinated with (about five) spine-like hairs. Length, $\frac{1}{75}$th of an inch.

This species is easily distinguished by the peculiar sculpturing of the carapace and by its elongated form, but more especially by the presence of the *three* spines which spring from the terminal claws of the abdomen, and which are very conspicuous under the microscope.

G. O. Sars thus describes the male of this species—"Mas femina minor marginem superiorem testæ rectum, antennasque primi paris aliquanto majores habet; pedum primum par ungue valde curvato armatum; postabdomen apicem versus attenuatum

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neque truncatum, unguibus terminalibus parvis, orificio genitali externo ante eosdem ad apicem abdominis sito."

Lynceus elongatus is common in elevated lakes and moorland tarns in Great Britain and Ireland. We have found it in almost all such localities that we have examined in the counties of Durham, Northumberland, Cumberland, Westmorland, Dumfriesshire, Kirkcudbrightshire, Rosshire, and also in Lewis and Connemara; but it appears to be of comparatively rare occurrence in lowland situations. On the Continent it is known to inhabit Prussia and Norway.

Lynceus striatus of Jurine appears to us to represent this species rather than the *Acroperus harpæ* of Baird.

4. LYNCEUS TENUICAUDIS, (*G. O. Sars.*) Pl. XIX, fig. 3.

1858. *Camptocercus alonoides*, Schoedler. Die Branchiopoden der Umgegend von Berlin, 1 Beitrage, p. 27 (*only name, no description*).

1862. *Alona tenuicaudis*, G. O. Sars. Om de i Omeg. af Christ. forkom. Clad. Andet Bidrag., p. 37.

1863. *Alona camptocercoides*, Schoedler. Neue Beitrage der Naturgeschichte der Cladoceren, p. 24. Pl. I, figs. 8–10.

Carapace subquadrangular, not short; dorsal margin well arched from the extremity of the rostrum to the supero-posteal angle; ventral margin nearly straight, ciliated; posterior margin truncate, with the infero-posteal angle well rounded and not furnished with any tooth; surface longitudinally striated, and when alive and highly magnified a few minute punctures are seen between the striæ. Head smaller and more depressed than in *L. quadrangularis*, rostrum blunt, hood-formed. Eye large, and the accompanying eye-spot more than half its size, situated midway between the eye and the extremity of the rostrum. Abdomen long, narrow, and parallel-sided, angular process minute, supero-posteal angle slightly produced but rounded off, abdominal spines, from eighteen to twenty, very minute, except

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the four or five spines nearest to the claws which rapidly increase in size posteriorwards, and are long and slender, the last situated round the supero-posteal angle; terminal claws long and slender with a well-developed spine springing from the base, and equal in size to the largest (last) of the marginal spines. Length, $\frac{1}{42}$nd of an inch.

We have only seen a single specimen of this interesting Lynceus, and from this the characters and figures here given are taken. The peculiarity of the spiny armature of the abdomen distinguish it at a glance from its congeners. The British specimen was taken by one of the authors (A. M. N.) in a small pond near Morden Moor Farm, in the parish of Sedgefield.* On the Continent it has been found near Berlin and in Norway.

G. O. Sars is of opinion that Müller's figures of *Lynceus quadrangularis* are intended to represent this species. It *may* be so; the length of the abdomen, as drawn, seems rather to point to *tenuicaudis* than to the more common form generally accepted as *quadrangularis;* but as we have stated in our notes on the latter species, in a case of doubt like the present, where it is impossible to decide, with anything approaching to certainty, which of several allied species (then grouped under one name) was more immediately intended by the author, it seems desirable to retain the name for the more common species to which it has hitherto been applied.

5. LYNCEUS QUADRANGULARIS, *Müller*. Pl. XXI, fig. 5.

1776. *Lynceus quadrangularis*, Müller. Zool. Dan. Prod., p. 199, No. 2393.

1843. *Alona quadrangularis*, Baird. Ann. and Mag. Nat. Hist. II, p. 92. Pl. III, figs. 9–11.

1860. *Lynceus affinis*, Leydig. Naturgeschichte der Daphniden, p. 223. Pl. IX, figs. 68, 69.

Carapace quadrangular, dorsal margin gently and regularly arched, posterior margin somewhat truncate, but its angles both

* A second locality is now known. Since the above has been in the printer's hands, *A. tenuicaudis* has been found more abundantly in a pond at Welbourne, Lincolnshire, by G. S. B.

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above and below well rounded off; no teeth at the infero-posteal angle; ventral margin straight, fringed with cilia; surface faintly longitudinally striate and (occasionally) reticulate. Head nearly erect, large, with a blunt, widely-rounded, hood-formed rostrum, which does not project beyond the ventral margin of the carapace; anterior antennæ considerably shorter than the hood; posterior antennæ short, one branch furnished with three, the other with five setæ. Eye-spot large, two-thirds the size of the eye, and nearer to the eye than to the extremity of the rostrum. Abdomen short and broad, and having the distal extremity truncate; its superior margin gently arched; supero-posteal angle distinct but rounded off; marginal spines, from fifteen to twenty, of nearly equal size, but increasing slightly in length from before backwards, one or two spines usually smaller than the others round the supero-posteal angle; a single obtuse process situated midway between the most anterior of the marginal spines and the origin of the abdominal setæ; terminal claws large, gently curved, and having a large secondary process springing from near their base, and more than one-third the length of the claw itself; there is also a tuft of very fine hairs at the origin of the claws. Length, $\frac{1}{10}$th of an inch.

Common throughout northern Europe* in lakes, ponds, canals, and slowly running streams.

The original description of the species by Müller, in the "*Zoologiæ Danicæ Prodromus*," is merely "cauda inflexa, testa subquadrangulari." From these words it is impossible to determine which of several species was intended. The figures given subsequently by the same author, in his work on the Entomostraca (pl. IX, figs. 1–3), are likewise insufficient for the purpose of identification. The form given to the abdomen certainly seems to give ground for the conclusion of G. O. Sars, that his *Lynceus tenuicaudis* is the species which Müller intended to represent. However, it is impossible to decide that point with certainty, and we follow therefore the rule which is generally observed in

* The Freshwater Entomostraca of the south of Europe have as yet been almost wholly neglected. *Lynceus quadrangularis* is not among the species found by Jurine in the neighbourhood of Geneva.

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such cases, by reserving the name of Müller for that species out of several closely allied forms which is most common, and which most subsequent authors have regarded as the type.

Many of the figures and descriptions of "Lynceus quadrangularis," given by authors, are insufficient to determine with accuracy whether the present form, or one of its allies, is intended. Leydig gives capital figures of the species, and describes it as new under the name of *Lynceus affinis;* while he in error describes and figures as *Lynceus quadrangularis* a widely different species, namely, the *Lynceus acanthocercoides* of Fischer and of this paper.

6. LYNCEUS COSTATUS, (*G. O. Sars*). Pl. XVIII, fig. 2; and Pl. XXI, fig. 7.

1862. *Alona costata*, G. O. Sars. Om de i Omegnen af Christiania forkommende Cladocerer. Andet Bidrag, p. 38.

Carapace quadrangular, short, and very broad; dorsal margin well arched; posterior margin truncate, but its angles above and below well rounded off; no teeth at the infero-posteal angle; ventral margin straight, fringed with cilia; surface longitudinally striate. Head nearly erect, large, with a blunt, hood-formed rostrum, not projecting beyond the ventral margin of the carapace; anterior antennæ entirely beneath the hood; posterior antennæ short, one branch bearing three, the other four setæ. Eye-spot scarcely half the size of the eye, situated midway between the eye and the extremity of the rostrum. Abdomen very short, gradually narrower towards the distal extremity, which is truncate; superior margin straight throughout and having a distinct posteal angle, which is produced and not rounded off; armed on the edge with from ten to fourteen spines, which gradually increase in size posteriorly; a small process at an obtuse angle, which is situated, as in *L. quadrangularis*, midway between the uppermost of the caudal spines and the origin of the abdominal setæ; terminal claws large, gently curved, and provided with a small secondary spinous process springing from near the base, but not one-fifth of the length of the claw itself, and of about equal size with one of the large abdominal spines. Length, $\frac{1}{20}$th of an inch.

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A much smaller species than *L. quadrangularis*, and distinguished from it by the much greater comparative breadth of the carapace, its more distinct striation, and by the character of the abdomen and its appendages.

Found in an old colliery pond at Bishop-Middleham, and in a pond near Houghton-le-Spring, county of Durham; at Rothley, Aird, Capheaton, Crag, Grindon, and Chartners Loughs, Northumberland (A. M. N.); Wallington, and Belsay Lake, Northumberland; Loch Skene and Lochmaben, Dumfriesshire; Lochend Loch, Kirkcudbrightshire; Connemara (G. S. B.). First described by G. O. Sars from Norway.

7. Lyncus guttatus, *G. O. Sars*. Pl. XVIII, fig. 6; and Pl. XXI, fig. 10.

1862. *Alona guttata*, G. O. Sars. Om de i Omegnen af Christiania forkommende Cladocerer. Andet Bidrag., p. 38.

Very like the last, but even shorter and broader. Carapace faintly striate longitudinally, and sometimes sculptured on the posterior portion with closely arranged circular pit-like impressions. Eye-spot midway between the eye and the extremity of the rostrum. Abdomen still shorter than in *L. costatus*, and having the superior margin straight posteally, and bearing from seven to ten ("eight to ten," Sars) spines, but hollowed out between the most anterior of the spines and the angle which is situated midway between that spine and the origin of the two abdominal setæ. Length, $\frac{1}{6}$th of an inch.

Closely allied to *L. costatus*, from which it may chiefly be distinguished by the cellular impressions (not always however evident) of the hinder part of the carapace, and by the form of the abdomen, which is furnished with fewer spines, and has a concavity in the superior margin immediately anterior to the spines.

Described by G. O. Sars from Norwegian specimens. First found in Great Britain in a small pond at East Herrington, in the county of Durham, and subsequently in Sweethope Lough, Northumberland, by A. M. N.; also in ponds at Marsden, county

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of Durham, and Cullercoats, Northumberland; in Easedale Tarn, Westmorland; and Thirlmere, Cumberland (G. S. B.).

8. LYNCEUS TESTUDINARIUS, *Fischer*. Pl. XVIII, fig. 7; and Pl. XXI, fig. 4.

1851. *Lynceus testudinarius*, Fischer. Mem. des Sav. étrangers, St. Petersbourg, Vol. VI, p. 191. Pl. IX, figs. 3–6.

1853. *Lynceus reticulatus*, Lilljeborg. De Crust. ex Ord. tribus Clad. Ostra. et Copep., p. 83. Pl. VII, figs. 6, 7.

1860. *Lynceus reticulatus* (?) and *L. testudinarius*, Leydig. Naturges. der Daphniden, p. 229.

1862. *Graptoleberis reticulata*, G. O. Sars. Om de i Omegnen af Christiania forekom. Clad. Andet Bidrag., p. 41.

1863. *Alona esocirostris*, Schoedler. Neue Beiträge zur Naturges. der Cladoceren, p. 25. Pl. I, figs. 26, 27.

1863. *Alona testudinaria*, Schoedler, l. c., p. 28.

Carapace oblong, dorsal margin only slightly arched (except in old females, when it is sometimes boldly arched); ventral margin straight, finely ciliated; posterior extremity truncate, infero-posteal angle with two or three large and conspicuous teeth; the whole surface of the shell, including even the head and rostrum, marked with irregularly quadrate reticulations. Head very large, in the form of a huge hood, nearly erect, extremity of the hood-formed rostrum very wide and rounded; anterior antennæ short, completely covered by the hood; posterior antennæ of moderate length. Eye very large; eye-spot not half its size. Abdomen small, short, tapering gradually to the distal extremity; no supero-posteal angle, the superior margin gradually sloping away to the base of the claws; a row of spines (so fine that they look as though they were merely setæ) on the edge; terminal claws short and stout, much curved, simple. Length, $\frac{1}{4}\frac{1}{4}$th of an inch.

This is a very pretty little species, and very distinct from all its allies. Its large hooded head; the peculiar straightness of the

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ventral margin, the large size of the teeth at the infero-posteal angle of the carapace; the conspicuous reticulated sculpture of the shell; and the unusual form of the short abdomen with its simple claws are all very marked characteristics.

Until recently we had always regarded this as the *Alona reticulata* of Baird; but Schoedler has now described and figured a species from Prussia, which appears to more closely agree with that author's description and figure than does the form known to ourselves. Had it been the *L. testudinarius* which Dr. Baird was describing, it seems very unlikely that he would have omitted all notice of the remarkably large teeth at the infero-posteal angle; but on the other hand, with the exception of this omission, and the remarkable difference in size ascribed to *A. reticulata*, both the description and figure given in the "*Natural History of the British Entomostraca*" closely accord with *L. testudinarius*. It must be understood, however, that while this species is certainly not the *A. reticulata* of Schoedler (but the same as that named by him *A. esocirostris*), and is *perhaps* not that originally described by Dr. Baird, it is the species thus named by Lilljeborg and G. O. Sars.

Lynceus testudinarius inhabits all those parts of the Continent of Europe where the Entomostraca have been carefully examined, viz., the countries of Russia, Prussia, Sweden, and Norway. In the British Islands it is not uncommonly found in the lakes and clearer ponds. We have taken it in Crag, Grindon, Darden, Chartners, and Belsay Loughs, Northumberland; Boldon Flats, Fardingslake, and Hardwicke, in the county of Durham; Hilton Fell, Westmorland; Lochmaben and Loch Skene, Dumfriesshire; Alemoor Loch, Selkirkshire, and in Connemara.

The *Alona reticulata* of Schoedler should be carefully looked for in Great Britain. While agreeing in the general characters of the carapace with *L. testudinarius*, the ventral line is not quite straight, being slightly concave in the middle; the head has more the form of *L. quadrangularis*, being less remarkably hood-shaped than in *L. testudinarius*, and the abdomen, instead of tapering to the extremity, is distally widely truncate, and the claws have a spine springing from their base.

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9. LYNCEUS RETICULATUS, (*Baird.*)

1843. *Alona reticulata*, Baird. Ann. and Mag. Nat. Hist., Vol. II, p. 93. Pl. III, fig. 12; and Trans. Berwickshire Naturalists' Club, Vol. II, p. 151.

1850. *Alona reticulata*, Baird. Brit. Entom., p. 132. Pl. XVI, fig. 3.

1863. *Alona reticulata*, Schoedler. Neue Beiträge zur Naturgeschichte der Cladoceren, p. 25. Pl. III, figs. 57, 58.

Dr. Baird's description of this species is as follows—"In size this is perhaps the smallest of all the species of this family, being still smaller than the *Acroperus nanus*. Shell of a quadrangular shape, rounded a little posteriorly, and nearly straight on anterior margin, which appears free from cilia. The lower margin is obtuse, and the whole shell is very closely reticulated. Beak prominent and long, projecting upwards, rather blunt. Eye large for size of animal, areolar. Inferior antennæ or rami rather slender; anterior branch provided with four setæ, one short from second, and three long and stout from last articulation; posterior branch has three from last joint only. Abdomen rather tapering towards the extremity, and serrated on inferior margin. Intestine convoluted, but it is not easily seen from reticulated surface of shell. One ovum. Habitat; found near Southall, Middlesex, July, 1841; September, 1849."

Schoedler's figures of the species, which he considers to be Baird's represent the ventral margin slightly ciliated, the inferoposteal angle well rounded, and not furnished with any teeth; and the abdomen broad, truncate at the extremity, the superoposteal angle well rounded, the claws long and slender, and furnished with a spine at the base.

Since our remarks on *L. testudinarius*, as well as on *trigonellus*, *uncinatus*, *rostratus* (ovatus) and *nanus* were penned, we have submitted specimens to Dr. Baird, who agrees with us in considering all the latter to be the species described by himself; but he does not regard the first as identical with his *reticulata*. Unfortunately, none of the types of the Lynceidæ described in

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the "*Natural History of the British Entomostraca*" are preserved, and as it is now many years since our friend has had any of these species passed through his hands, he naturally hesitates to express a very decided opinion, although he has little or no hesitation about them. It is worthy of especial remark, that in all the cases of doubt, there is nothing in the descriptions by Dr. Baird which is at variance with the forms which we regard as his species; in each instance the difference consists in the mode of sculpture of the carapace as represented in the figures, and it should be borne in mind that the drawings were not all executed by Dr. Baird, but by an artist, who, not having studied the animals, was perhaps not sufficiently careful in the delineation of certain minute details, of the importance of which he was not aware.

10. LYNCEUS EXIGUUS, *Lilljeborg*. Pl. XVIII, fig. 3; and Pl. XXI, fig. 3.

1853. *Lynceus exiguus*, Lilljeborg. De Crust. Clad. Ostra. et Copep. in Scania occurrentibus, p. 79. Pl. VII, figs. 9, 10.

1854. *Lynceus excisus*, Fischer. Bulletin de Soc. Imp. des. Natural. de Moscou, p. 428. Pl. III, figs. 11–14.

1860. *Lynceus exiguus*, Leydig. Naturges. der Daphniden, p. 228.

1862. *Alonella excisa*, G. O. Sars. Om de i Omegnen af Christ. forekom. Clad. Andet Bidrag., p. 52.

1863. *Pleuroxus excisus* and *exiguus*, Schoedler. Neue Beiträge zur Naturges. der Clad., p. 49 and 51.

Carapace subovate, abruptly truncate posteriorly; ventral margin gently and dorsal strongly arched, the former ciliated; inferoposteal angle produced downwards to an acute point, behind which, on the posterior margin, are two or three minute serratures; surface reticulated, reticulations mostly hexagonal. Head semi-erect, hooded, rostrum a little produced, and acute, bending downwards at the extremity; anterior antennæ not reaching the

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end of the rostrum. Eye-spot about half the size of the eye. Abdomen of moderate length, inferior margin slightly arched, superior nearly straight anteriorly, furnished with a conspicuous blunt process, marginal teeth, from twelve to fourteen, sub-equal, supero-posteal angle produced; terminal claws rather short, gently curved, having a secondary claw at the base, which is nearly half the length of the primary claw. Length, $\frac{1}{76}$th of an inch.

This species has been found in the following Northumberland Loughs, Crag, Green Lea, Broomley, Chartners, Darden, and a small pond on the moors near Winters Stob (A. M. N.); also in North Shaws Loch, Selkirkshire; Lochmaben, Dumfriesshire; Easedale Tarn and Thirlmere (G. S. B.); all these being in elevated situations.

On the Continent it is known to inhabit Norway, Sweden, and Russia.

11. LYNCEUS ACANTHOCERCOIDES, *Fischer*. Pl. XIX, fig. 5; and Pl. XXI, fig. 7.

1854. *Lynceus acanthocercoides*, Fischer. Bulletin de Soc. Imp. des Natural. de Moscou, p. 431. Pl. III, figs. 21–25.

1860. *Lynceus quadrangularis*, Leydig. Naturges. der Daphniden, p. 221. Pl. VIII, fig. 59.

1860. *Lynceus acanthocercoides*, Leydig. Naturges. der Daphniden, p. 231.

1863. *Eurycercus acanthocercoides*, Schoedler. Neue Beiträge der Naturgeschichte der Cladoceren, p. 11.

1863. *Alona Leydigii*, Schoedler. Neue Beiträge der Naturg. der Clad., p. 27.

Carapace short, broad, nearly semicircular, well and regularly arched from the extremity of the rostrum round the back and thence to the infero-posteal angle, which angle is not furnished with any spine; the carapace posteriorly extends considerably beyond the dorsal separation of the valves, the posterior extremity being produced and rounded; ventral margin straight, ciliated, cilia long; surface longitudinally striate. Head of moderate size,

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remarkably erect, anterior antennæ reaching the extremity of the rostrum; tentacular hairs very long. Eye-spot very large. Abdomen very large and deep, supero-posteal angle completely rounded off; instead of being furnished with a single line of lateral spines, as is usual in the genus, this species has the minute spines which are on the anterior portion gradually increasing in size, and arranged posteriorly in groups of two or three spines each, which are of different lengths, each group of spines being placed in an oblique direction on the side of the abdomen; abdominal claws long, slender, and simple (not furnished with any spine). Length, $\frac{1}{15}$th of an inch.

The circumstances under which we are enabled to give this species as a member of the British Fauna are so remarkable, that we venture to give them at length. One of the authors of the present paper (A.M.N.) brought home, one afternoon in the summer of 1864, a bottle of water, containing a large quantity of Entomostraca, from a pond in Lambton Park, county of Durham. The gathering was almost entirely composed of a mass of *Daphnia pulex*. While examining this gathering, under the microscope, a portion of the abdomen of a *Lynceus* floated across the field, which at once struck him as different from anything known in Britain before; but at the same moment it flashed across him that he had seen and made a tracing of the figure of such an abdomen; and, taking down a M.S. book from his library, he found that the portion of the Lynceus which he had found agreed exactly with the figure of Fischer's *Lynceus acanthocercoides*, published in the Bulletin of the Imperial Society of Naturalists at Moscow. Greatly interested in this discovery he carefully passed, drop by drop, under the microscope, the whole of the gathering obtained, in the hope of obtaining perfect specimens. He was so far successful as to find a cast slough of a carapace, apparently that to which the abdomen had belonged, and this entirely bore out the identity of the species with that of Fischer. No perfect specimen could however be found, and subsequent visits to the pond have as yet proved equally unsuccessful. Since no perfect British specimen has as yet been met with, the figures given of this species are copies from Fischer.

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Lynceus acanthocercoides has been found in Russia, Prussia, and Norway.

12. LYNCEUS FALCATUS, (*G. O. Sars*). Pl. XVIII, fig. 4; and Pl. XX, fig. 1.

1861. *Alona falcata*, G. O. Sars. Om de i Omegnen af Christ. forekom. Cladocera, p. 20.

1862. *Harporhynchus falcatus*, Sars. Om de i Omeg. af Christ. forekom. Clad. Andet. Bidrag., p. 41.

Carapace of remarkable form, deeper behind the middle than in front; dorsal margin slightly arcuate; ventral nearly straight, fringed with long cilia; posterior obliquely and widely truncate; infero-posteal angle rounded off, without spines; surface obscurely striated. Head very erect at first, produced subsequently into a very long slender falciform rostrum, which is curved downwards between the posterior antennæ; anterior antennæ large; posterior short. Eye-spot much larger than the eye. Abdomen having no marginal teeth, except two or three of considerable size at the posterior angle, which is well rounded off; the sides, however, of the abdomen, are furnished with several rows of delicate hair-like spines; claws long and nearly straight, with a secondary spine of moderate length springing from the base. Length, $\frac{1}{50}$th of an inch.

Sars describes the male as having the long rostrum larger than in the female, widening and swollen at the extremity, and apparently movable, so much so that he suggests that it may be used for the purpose of seizing the female.

Sars is the only writer who has described this interesting species. In this country we have met with it in two of the lakes of Northumberland, viz., Sweethope (G. S. B.) and Green Lee (A. M. N.); also in Lochend Loch, Kirkcudbrightshire; and Lochmaben Castle Loch, Dumfriesshire (G. S. B.). In all these localities it was numerically scarce.

13. LYNCEUS TRUNCATUS, *Müller*. Pl. XXI, fig. 9.

1781. *Lynceus truncatus*, Müller. Entomostraca, p. 75. Pl. XI, figs. 4–6.

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1848. *Lynceus truncatus*, Liévin. Die Branchiopoden der Danziger Gegend, p. 40. Pl. X, figs. 2, 3.

1850. *Peracantha truncata*, Baird. Brit. Entom., p. 136. Pl. XVI, fig. 1.

1851. *Lynceus truncatus*, Fischer. Mem. presentés a l' Acad. Imp. des Sciences de St. Petersbourg par divers Savans, Vol. VI, p. 190. Pl. IX, figs. 7–11.

1853. *Lynceus truncatus*, Lilljeborg. De Crust. Clad. Ostra. et Copep., p. 82. Pl. VI, fig. 10.

1860. *Lynceus truncatus*, Leydig. Naturgeschichte der Daphniden, p. 224.

1863. *Peracantha truncata*, Schoedler. Neue Beiträge der Naturgeschichte der Cladoceren, p. 40. Pl. II, figs. 29, 30.

Carapace ovate, often dorsally gibbous, posteriorly subtruncate; ventral margin somewhat flexuous and arcuate, anteriorly furnished with a row of spiny processes which have their apices curved upwards, posteriorly strongly ciliated; posterior extremity armed all along the edge with a series of large tooth-like processes, the hindermost of which are directed backwards; surface divergently striated. Head terminating in an acute rostrum, projected horizontally, and not extending beyond the ventral line of the carapace; anterior antennæ very short, thick, appearing beneath the rostrum; posterior antennæ short. Eye of moderate size; eye-spot scarcely half as large as the eye, situated nearer to it than to the extremity of the rostrum. Abdomen of moderate length and size, rather broad, wider at the base than at the extremity, distally truncate, the angle pronounced and somewhat produced; superior margin bearing about twelve spines; claws of moderate length, slightly curved, furnished with two secondary spines springing from near the base, and situated close together. Length, $\frac{1}{37}$th of an inch.

Common in ponds, slow-running streams, and lakes; ranging throughout the whole of northern Europe.

Schoedler describes a closely allied form under the name of

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Peracantha brevirostris, the title of which conveys the chief character by which he would distinguish it from *P. truncata*. The male of the latter species differs from the female in a similar manner, the rostrum being shorter, and the superior antennæ extended further beyond it.

14. LYNCEUS LÆVIS, (*G. O. Sars*). Pl. XVIII, fig. 5; and Pl. XXI, fig. 14.

1844. *Lynceus trigonellus*, Zaddach. Synopsis Crust. Pruss. Prod., p. 28 (but not of other authors).

1858. *Pleuroxus ornatus*, Schoedler. Die Branchiop. der Umg. von Berlin. 1 Beitrag, p. 28 (*name only, no description or figure*).

1861. *Pleuroxus lævis*, G. O. Sars. Om de i Omeg. af Christ. forekom. Cladocerer, p. 22.

1862. *Pleuroxus hastatus*, G. O. Sars. Om de i Omeg. af Christ. forekom. Cladocerer. Andet Bidrag., p. 52.

1862. *Pleuroxus ornatus*, Schoedler. Die Lynceiden u Polyphemiden d. Umgegend von Berlin (Jahresbericht der Dorotheenst. Realschule), p. 25. Pl. II, fig. 32.

1863. *Pleuroxus ornatus*, Schoedler. Neue Beiträge zur Naturgeschichte der Cladoceren, p. 47. Pl. II, fig. 32.

Carapace long, ovate, posterior extremity narrow, truncate, only very slightly oblique; dorsal margin boldly arched from the end of rostrum to the junction with the posterior extremity; ventral margin ciliated throughout, anteriorly very convex, medially sinuate, posteriorly receding towards dorsal margin, infero-posterior angle produced downwards into a small spine-like point, no teeth; surface punctate and obscurely reticulated, reticulations hexagonal. Head produced into a long, acute rostrum, which is projected nearly horizontally. Eye-spot half the size of the eye, and much nearer to it than to the end of the rostrum; anterior antennæ much shorter than the rostrum; posterior antennæ very short. Abdomen narrowing gradually towards the claws, superior margin with a slight sinus anterior to the row

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of (about fourteen) very minute teeth, the two last of which however are considerably larger than those which precede them; supero-posteal angle distinct, but not produced, nearly a right angle; claws very long and slender, scarcely curved, but somewhat flexuous, furnished near the base with two spines situated close together, of which that nearest the base is much the smaller. Length, $\frac{1}{10}$th of an inch.

In outline, and in the character of the abdomen, this species approaches very closely to *L. truncatus*, from which it is distinguished by the total absence of the armature of the posterior extremity, and of the anterior portion of the ventral margin, as well as by the different character of the surface-sculpture of the carapace.

We have felt some hesitation as to what name this species ought to bear. It was first *named*, but not described, in 1858, by Schoedler, as *Pleuroxus ornatus;* next, in 1861, it was described by G. O. Sars, under the name of *Pleuroxus lævis;* in the following year Sars changed the name which he had applied to it to *Pleuroxus hastatus*, and about the same time Schoedler described it under the title which he had previously given in M.S. The name, *ornatus*, therefore, dates from 1862, as does also that of Sars, *hastatus:* the "only way out of the wood" appears to be the adoption of the first name of Sars, viz., *Pleuroxus lævis*. Confusion almost invariably arises from an author attempting to change a name which he had already given to a species. For the last seventy years it has been a constant bone of contention among carcinologists which of the two names, *vetula* and *sima*, given by Müller to the commonest species of Daphnia, should be retained. The majority of writers have used the latter and later-applied name; the minority have held that an author has no power to change a name once given, and with them the species bears the name *D. vetula*. G. O. Sars is one of those who, as we hold rightly, adopts the first-given name of *vetula*, and in this precisely parallel case we apply the same rule to his own names, and have called the present species *Lynceus lævis*.

We have not seen the reticulation of the surface as distinctly marked in any of our specimens as it is represented in Schoedler's

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smooth or only slightly punctate over the greater part of the figure. In some of our examples it is not to be seen at all; and where present is more obvious on the central and dorsal portion of the carapace, while the punctation is more evident towards the ventral margin.

First found by one of us (G. S. B.) in Crag Lough, Northumberland, and subsequently at "Hell Kettles," near Darlington. On the Continent it is known to inhabit Prussia and Norway.

15. LYNCEUS TRIGONELLUS, *Müller*. Pl. XXI, fig. 11.

1776. *Lynceus trigonellus*, Müller. Zool. Dan. Prod., No. 2395.

1820. *Lynceus aduncus*, Jurine. Histoire des Monocles, p. 152. Pl. XV, figs. 8, 9.

1848. *Lynceus trigonellus*, Liévin. Die Branchiopoden der Danziger Gegend, p. 41. Pl. X, fig. 4.

1850. ♀. *Pleuroxus trigonellus*, Baird. Brit. Entomos., p. 134. Pl. XVII, fig. 3, the *female*.

1850. ♂. *Pleuroxus hamatus*, Baird. Brit. Entomos., p. 136. Pl. XVII, fig. 5, the *male*.

1851. *Lynceus aculeatus*, Fischer. Mem. presentés a l' Academie Imp. des Sciences de St. Petersbourg, par divers Savants, p. 192. Pl. X, figs. 1, 2.

1853. *Lynceus trigonellus*, Lilljeborg. De Crust. ex Ord. tribus Clad. Ostrac. et Copep., p. 80. Pl. IX, fig. 1.

1860. *Lynceus trigonellus*, Leydig. Naturges. der Daphniden, p. 223.

1863. *Pleuroxus trigonellus*, Schoedler. Neue Beiträge zur Naturges. der Cladoceren, p. 44. Pl. II, figs. 33–36.

1863. *Pleuroxus aduncus* and *Bairdii*, Schoedler, l. c., p. 46 and 50.

Carapace subovate, much wider in front than at the posterior extremity, which is obliquely truncate; dorsal margin strongly arched; ventral flexuous, finely denticulated on the edge of the anterior portion; fringed with long cilia; infero-posteal angle not produced, furnished with two or three minute teeth; surface

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carapace, but the infero-anteal portion of the valves (i.e., the portion which covers the feet) is sculptured with arched striæ, as represented in the figures of Jurine and Schoedler. Head not hooded, produced into a long acute rostrum, which is bent downwards; anterior antennæ considerably shorter than the rostrum; posterior antennæ short. Eye of moderate dimensions, eye-spot fully half its size, situated about midway between the eye and the extremity of the rostrum, rather nearer the former. Abdomen short, rather broad, somewhat narrowed at the extremity, where it is broadly truncate, sinus anterior to the marginal spines slight, marginal spines very minute, subequal in size; claws slender, curved, having a delicate spine springing from near the base. Length, $\frac{1}{10}$th of an inch.

The form of the carapace is not unlike that of the last-described species; but independently of the difference in surface sculpture of the carapace, and the position and size of eye-spot, &c., a glance at the abdomen, which is very distinct in the two species, at once suffices to distinguish them. As compared with *L. lævis*, moreover, the carapace of *P. trigonellus* is very much wider in front. At "Hell Kettles," and Crag Lake, the two species are found in company.

This species appears to range throughout the whole of Europe, having been observed at Geneva, in Russia, Prussia, Norway, Sweden, and the British Islands. In our own country it appears to be a local species, though generally distributed, having been found by Dr. Baird in several places around London, in a pond at Fouldean, Berwickshire, and at Yetholm, Roxburghshire; by A. M. N. in Hardwicke Lake and the Forge Dam, near Sedgefield, county of Durham, in Crag Lough, and Holy Island Lough, Northumberland; by G. S. B. at "Hell Kettles," county of Durham, and Lochmaben, Dumfriesshire; and by Mr. D. Robertson in the Paisley Canal, near Glasgow. It delights in clear water.

The *Pleuroxus hamatus* of Baird, with its hook-formed feet for clasping the female, is (as was suggested might be the case by Dr. Baird himself in a foot note) the male of his *Pleuroxus trigonellus*.

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16. LYNCEUS UNCINATUS, (*Baird*). Pl. XVIII, fig. 9; and Pl. XXI, fig. 13.

1850. *Pleuroxus uncinatus*, Baird. Brit. Entom., p. 135. Pl. XVII, fig. 4.

1860. *Lynceus uncinatus*, Leydig. Naturgeschichte der Daphniden, p. 228.

1860. *Lynceus personatus*, Leydig. Naturges. der Daphniden, p. 227. Pl. IX, fig. 70.

1862. *Rhypophilus glaber*, Schoedler. Die Lynceiden u. Polyphemiden der Umgegend von Berlin, p. 26.

1863. *Rhypophilus glaber*, p. 55. Pl. III, figs. 54–56; *Rhipophilus uncinatus* and *personatus*, p. 56, Schoedler. Neue Beiträge zur Naturgeschichte der Cladoceren.

In most respects as the last, but the dorsal margin is more boldly arched, and the infero-posteal angle has three or four large (instead of minute) teeth; the surface of the valves is either smooth or reticulated, the reticulations being pentagons, hexagons, or heptagons; and the marginal spines of the abdomen are very much larger and fewer in number. The character however which at once distinguishes it from all our known Lyncei is, that the extremity of the long acute rostrum is bent upwards and backwards, and thus assumes a hook-like form. Length, $\frac{1}{12}$nd of an inch.

"Pond between Hanwell and Southall, Middlesex," Dr. Baird; Green Lee Lough, Northumberland, A. M. N.; East Belsay and Wallington Lakes, Northumberland; Oakermoor Loch, South and North Shaws Lochs, Selkirkshire; Lochmaben, Dumfriesshire, G. S. B.; Paisley Canal, near Glasgow, Mr. D. Robertson. Abroad it has been found in Prussia and Norway.

It is not without hesitation that we have adopted the name of *uncinatus* for the species which we have described, which is certainly the *personatus* of Leydig, and in another state the *glaber* of Schoedler. All the specimens that we have seen are either reticulated or devoid of sculpture. We have never met with any obliquely striated as represented in Dr. Baird's figure; and

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if that figure be correct, we hold that his species must be different from that which has been met with by ourselves, which would then have to bear Leydig's name, *personatus*. We have never seen any of the Cladocera to be at one time reticulated and at another striated; though certain species sometimes have the usually characteristic sculpturing, whether striation or reticulation, of the valves obsolete; and some, as *L. quadrangularis*, have on some parts of the carapace a combination of reticulated and striated markings.

17. Lynceus rostratus, *Koch*. Pl. XIX, fig. 1; and Pl. XXI, fig. 6.

1841. *Lynceus rostratus*, Koch. Deutschlands Crustaceen, Myriapoden und Arachniden, p. 36. Pl. 12.

1850. (?) *Alona ovata*, Baird. British Entomostraca, p. 133. Pl. XVI, fig. 2.

1853. *Lynceus rostratus*, Lilljeborg. De Crust. ex Ordin. tribus Clad. Ostrac. et Copep. in Scania occurrentibus, p. 78. Pl. VI, fig. 9.

1854. *Lynceus griseus*, Fischer. Bul. de Soc. Imp. des Natur. de Moscou, p. 430. Pl. III, figs. 17–20.

1860. *Lynceus rostratus* and *griseus*, Leydig. Naturges. der Daphniden, p. 227 and 231.

1862. *Alonella rostrata*, G. O. Sars. Om de i Omeg. af Christ. forkom. Cladocerer. Andet Bidrag., p.

1863. *Lynceus rostratus* and *griseus*, Schoedler. Neue Beiträge zur Naturgeschichte der Cladoceren, p. 48 and 49.

Carapace ovate, rather elongated, dorsal margin gently and equally arcuate; ventral convex, fringed with long cilia, the infero-posteal angle completely rounded off, and not furnished with any teeth; posterior margin rounded with the ventral, but somewhat angulated at its junction with the dorsal margin; surface arcuately striate, the infero-anteal portion of the carapace (i.e.,

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that part which covers the feet) reticulated. Head very upright, hood-shaped, and produced into an acute rostrum; anterior antennæ much shorter than the head; posterior antennæ of moderate length. Eye of moderate size; eye-spot nearly as large as the eye, situated midway between it and the extremity of the rostrum. Abdomen of moderate size, having the superior margin rounded off to the base of the claws, there is thus no supero-posteal angle; marginal spines (from ten to twelve) small; claws long and slender, gently curved, with a minute spine springing from the base. Length, $\frac{1}{75}$th of an inch.

The description given by Dr. Baird of his *Alona ovata* for the most part well accords with the characters of the present species, especially the statements that "the shell is striated; *striæ waved longitudinally*.....Eye areolar, *anterior black spot large*.....*the head is erect*, as in *A. quadrangularis*;" but on the other hand, the examination of the figure given, and the dimension of the species, "in size it is rather larger than the *A. quadrangularis*," leave us in doubt as to whether the species described by him is synonymous or not with *L. rostratus*.

L. rostratus has been observed on the Continent in Prussia, Germany, Sweden, and Norway. The only British habitat we know for it is the East Lake at Belsay, Northumberland. The lake in question is only a small piece of water, yet is sufficiently large to afford an entirely different Entomostracan Fauna in different parts. The authors visited this lake together, and while the one (A. M. N.) procured his gathering of Entomostraca at the extremity of the lake, the other (G. S. B.) was fishing about the middle of its length. On returning home and examining the proceeds under the microscope, while the former found that he had nothing of value, the latter discovered that he had taken not only such rare things as *Macrothrix laticornis* and *Ilyocryptus sordidus*, but also two interesting additions to the British Fauna, namely, *Monospilus tenuirostris* (Fischer), and *Lynceus rostratus* (Koch). The circumstance impressed more deeply a lesson, which was not then learnt for the first time, that it is very easy to procure gatherings again and again from a piece of water, of even very limited area, and yet to remain very imperfectly acquainted with

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the Crustacea which live in it. It often happens, that in the same spot which at one visit has produced a species in the greatest profusion, on the next not one can be found. This has occurred to us in the present instance; for on a subsequent visit to Belsay Lake, undertaken at a somewhat earlier period of the year, not one of these interesting species was taken, but we were rewarded by the capture of some remarkable Ostracoda. No doubt such fluctuations in the appearance of species of Entomostraca is dependent, in no slight degree, upon the different conditions under which our search is conducted, and that the exact season of the year, the time of day, the force and direction of the wind, the degree of sunlight and sunshine, and the variations in temperature, must all be taken into account; but no one of these secondary causes, nor all of them taken together, seem sufficient to account for the capriciousness which, in our experience, has characterized the appearance and disappearance of certain species of the smaller Crustacea in particular localities.

18. Lynceus nanus, (*Baird*). Pl. XVIII, fig. 8; and Pl. XXI, fig. 8.

1843. *Acroperus nanus*, Baird. Ann. and Mag. Nat. Hist., Vol. II, p. 92. Pl. III, fig. 8.

1850. *Acroperus nanus*, Baird. Nat. Hist. Brit. Entom., p. 130. Pl. XVI, fig. 6.

1853. *Lynceus nanus*, Lilljeborg. De Crust. ex Ord. tribus Clad. Ostra. et Copep., p. 206.

1860. *Lynceus nanus*, Leydig. Naturgeschichte der Daphniden, p. 228.

1861. *Alona pygmæa*, G. O. Sars. Om de i Omeg. af Christ. forekom. Cladocerer, p. 21.

1862. *Alonella pygmæa*, G. O. Sars. Om de i Omeg. af Christ. forekom. Cladocerer. Andet Bidrag., p. 48.

1863. *Acroperus nanus*, Schoedler. Neue Beitrage zur Naturg. der Cladoceren, p. 33.

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1863. *Pleuroxus transversus*, Schoedler. Neue Beitrage zur Naturg. der Cladoceren, p. 50.

Carapace ovate, posteriorly subtruncate, ventral margin slightly waved, fringed on the posterior half with a few cilia; dorsal margin well rounded from the rostrum to the infero-posteal angle, which is furnished with a single minute tooth; surface curiously sculptured with strongly marked oblique waved striæ, which instead of, as is the case in all other species, having their direction towards the infero-posteal angle, incline towards the supero-posteal angle, or in other words, proceed from the front portion of the ventral margin to the hinder portion of the dorsal margin; the carapace is unusually opaque, and of a dark colour. Head depressed with a produced rostrum, which is bent downwards. Eye-spot more than half the size of the eye, nearer to it than to the extremity of the rostrum. Abdomen short, very deep, distal angle rounded off, a very strongly developed anterior process; marginal teeth few (from seven to nine), extending to the base of the claws; claws small, with a very small spine springing from the base. Length, $\frac{1}{11\frac{1}{2}}$th of an inch, the smallest of our Cladocera.

Sars thus describes the male of this species—"Mas femina angustior rostro obtusiore antennisque primi paris majoribus insignis; margo postabdominis posterior fere æqualis nullum processum formans; pedum primum par ut in ceteris Lynceidis ungue curvato præditum."

The sculpture of the valves of this species is very peculiar, looking at the anterior margin it seems almost as though the shell was composed of a number of superimposed plates; the striæ ascend from the lower portion of the ventral margin directly upwards, then suddenly bending backwards (the lower ones at a very acute angle) they descend, with a more and more arcuate sweep as they approach nearer to the head, to the hinder extremity of the carapace. Moreover the striation is not, as in other Lyncei, a mere superficial marking of the carapace, but consists of a series of deep concave *grooves*, so that when the animal is turned in the field of the microscope, so as to give a direct anterior

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or posterior view, the outline is seen to be beautifully emarginate or fluted.

Lynceus nanus delights in the purer water of the large ponds and of lakes. In such situations we have found it to be generally diffused in the counties of Durham, Northumberland, Kirkcudbright, Dumfries, Selkirk, Ross, and in Connemara. Sars meets with it in Norway, Lilljeborg in Sweden, and Schoedler in Prussia.

19. LYNCEUS GLOBOSUS, (*Baird*). Pl. XX, fig. 5.

1850. *Chydorus globosus*, Baird. Brit. Entom., p. 127. Pl. XVI, fig. 7.

1853. *Lynceus globosus*, Lilljeborg. De Crust. ex Ord. tribus Clad. Ostrac. et Copep., p. 85. Pl. VIII, fig. 1.

1860. *Lynceus globosus*, Leydig. Naturges. der Daphniden, p. 230.

1863. *Chydorus globosus*, Schoedler. Neue Beiträge zur Naturges. der Cladoc., p. 13.

1863. (?) *Chydorus cælatus*, Schoedler, l. c., p. 15. Pl. II, fig. 44.

Carapace quite globular, the posterior extremity completely rounded with the ventral and dorsal margins; ventral margin having a row of cilia which take their origin a little within the edge of the shell; valves having a dark brown stain in the centre, hexagonally reticulated, the reticulations are apparently scaly processes, and towards the ventral margin the raised edges of these scales, being more conspicuous, present the appearance (under a lower power of the microscope) of waved circular striations and small black spots, as described by Dr. Baird. Head depressed, produced into a very long and slender rostrum which is curved downwards; anterior antennæ short and thick. Eye-spot not half the size of the eye. Abdomen short and narrow, nearly parallel-sided, superior margin slightly sinuated toward the extremity; posterior angle distinct, much produced, marginal teeth, about eighteen in number, extending round the posterior

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angle; those on the angle considerably longer than the rest; claws very long and slender; the hinder edge is ciliated throughout its entire length, and a very small spine springs from the base. Length, $\frac{1}{13}$rd of an inch.

Not common; an inhabitant of lakes and large pieces of water. Dr. Baird procured the type specimens near London, and met with it in two or three places in that neighbourhood. We have seen it from Crag Lough, in Northumberland (A. M. N. and G. S. B.), Windermere, Grasmère, and Connemara (G. S. B.); and the Paisley Canal (Mr. D. Robertson). On the Continent it is known to inhabit Prussia, Norway, and Sweden.

20. LYNCEUS SPHÆRICUS, *Müller*. Pl. XXI, fig. 12.

1776. *Lynceus sphæricus*, Müller. Zool. Dan. Prod., No. 2392.

1844. *Lynceus sphæricus*, Zaddach. Syn. Crust. Prussic. Prod., p. 29.

1848. *Lynceus sphæricus*, Liévin. Die Branchiopoden der Danziger Gegend, p. 41. Pl. X, fig. 5.

1850. *Chydorus sphæricus*, Baird. Brit. Entom., p. 126. Pl. XVI, fig. 8.

1851. *Lynceus sphæricus*, Fischer. Mem. preséntes a l' Academie Imper. des Scien. de St. Petersbourg par divers Savans, Vol. VI, p. 192. Pl. IX, figs. 13–15.

1851. *Lynceus sphæricus*, ♂ Zenker. Müller's Archivs fur Phys., &c., p. 119. Pl. III, fig. 3.

1853. *Lynceus sphæricus*, Lilljeborg. De Crust. ex Ord. tribus Clad. Ostrac. et Copep., p. 86. Pl. VII, figs. 12–17.

1860. *Lynceus sphæricus*, Leydig. Naturges. der Daphniden, p. 225.

1863. *Chydorus sphæricus*, Schoedler. Neue Beiträge zur Naturges. der Cladoceren, p. 12. Pl. I, figs. 5–7.

Carapace nearly like that of the last species in form but very much smaller, less regularly round, the posterior extremity being slightly truncated; the rostrum not quite so long, the eye-spot

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larger, and more than half the size of the eye; the centre of the shell is not dark coloured, and the surface is generally smooth, though sometimes more or less reticulated; the reticulations when present appear more especially on the infero-anteal portion of the shell. Abdomen broad at the base; the posterior angle not produced, being well rounded off, and armed with about eight fine teeth, in front of which the margin is rather deeply excavated. Length, $\frac{1}{20}$th of an inch.

Male smaller and narrower, the rostrum shorter and blunter; the anterior antennæ much wider and flatter, having two tentaculiform setæ on the middle of the anterior margin, and the terminal setæ larger and more numerous; first feet furnished with a large, hook-formed clasping process, the bend of which forms half an ellipse; abdomen of totally different form from that of the female, very narrow, arch-formed, having a very deep concavity excavated, as it were, out of the superior margin. It has been previously described and figured by Zenker and Lilljeborg.

Abundant everywhere, both in large lakes, and small rain pools which dry up in the summer; in clear or stagnant water. It appears to be a variable species, varying according to the situation in which it lives. It is found in every part of Europe that has been examined. Possibly more than one species may have been confounded in Great Britain under the name *L. sphæricus*. Schoedler describes a species under the name *Chydorus nitidus*, and G. O. Sars has named others *Chydorus piger* and *latus;* and it is probable that these forms occur in our Islands.

Genus. EURYCERCUS, *Baird.*

Head as in Lynceus, but excessively wide, so that the animal, viewed from above, is seen to be wedge-shaped; the head excessively broad, much wider than the valves, and these last gradually approaching nearer to each other towards the posterior extremity. Eye-spot small, placed near the eye. Posterior antennæ having one branch terminating in three setæ and a spine, and another spine at the end of the first joint, the other bearing five setæ, and a spine at the extremity. Six pairs of

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feet, the last rudimentary. Abdomen a wide flattened blade, having a beautifully serrated edge; the serrations are portions of the margin itself, and not articulated spines. Excretory orifice at the end of the abdomen immediately below the terminal claws.

EURYCERCUS LAMELLATUS, (*Müller*). Pl. XX, fig. 8.

1844. *Lynceus lamellatus*, Zaddach. Synop. Crust. Pruss. Prod., p. 28.

1848. *Lynceus lamellatus*, Liévin. Die Branch. der Danziger Gegend, p. 39. Pl. IX, figs. 1–9.

1850. *Eurycercus lamellatus*, Baird. Brit. Entom., p. 124. Pl. XV, fig. 1.

1851. *Lynceus laticaudatus*, S. Fischer. Mem. presentés a l' Academie des Sciences de St. Petersbourg, Vol. VI, Pl. VII, figs. 4–7.

1853. *Lynceus lamellatus*, Lilljeborg. De Crust. ex Ord. tribus Ost. Clad. et Cop., p. 71. Pl. V, figs. 7–12; Pl. VI, figs. 1–7; and Pl. VII, fig. 1.

1860. *Lynceus lamellatus*, Leydig. Naturges. die Daphniden, p. 209. Pl. VII, figs. 52–56; and Pl. X, fig. 72.

1863. *Eurycercus lamellatus*, and *E. laticaudatus*, Schoedler. Neue Beiträge zur Naturges. der Cladoceren, p. 9. Pl. I, fig. 28.

Carapace somewhat quadrangular, dorsal margin well arched, posterior extremity truncate and finely denticulated; infero-posteal angle rounded off, not furnished with any teeth; ventral margin nearly straight, ciliated. Head well rounded, rostrum wide, blunt, short, rounded at the extremity; anterior antennæ conspicuous, conical, tapering to the end, which terminates in a circle of about eight spine-formed points; posterior antennæ having a spine at the end of the peduncle, all the joints of the branches closely beset round their extremities with little spines; one branch with a spine on the first joint, and terminating in three setæ and a spine, the other with five setæ and a terminal spine; all the setæ geniculate and plumose. Abdomen in the

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form of a broad flattened blade, with a very closely serrated margin, serrations smallest near the abdominal setæ and gradually increasing in size towards the claws, distal extremity of abdomen abruptly truncate on the supero-posteal portion, but produced inferiorly into a process of considerable size, which is margined on either side with a row of articulated spines, and supports the terminal claws; claws strong, acute, but little curved, ciliated on the edge, and having two spines attached to their base. Length, $\frac{1}{16}$th of an inch.

Perhaps the commonest member of the family: occurring in ditches, small ponds, canals, slow-running rivers, and lakes. It inhabits the whole of northern Europe, but is not among the Entomostraca described by Jurine from the neighbourhood of Geneva.

GENUS. MONOSPILUS, *G. O. Sars.*

Carapace composed of a series of valves laid one over another. Head depressed; rostrum produced, acute. Compound eye wholly absent, eye-spot present; one branch of posterior antennæ furnished with four setæ and a spine, the other with three setæ and two spines. Abdomen short and unusually broad, with numerous spines varying greatly in size, irregularly disposed on the edge and sides. Inhabiting lakes.

This genus was established by G. O. Sars in 1861 for the reception of an Entomostracan which he had met with in Norway, and named *Monospilus dispar;* the species however is evidently the same as that described, many years previously by Fischer, in the "*Bull. de Soc. Imp. des Nat. de Moscou,*" under the name *Lynceus tenuirostris.*

The most remarkable features in *Monospilus* are the peculiar structure of the carapace and the total absence of the usual compound eye of the Cladocera. The only organ of vision (if organ of vision it be) is the simple eye-spot, which occupies its usual position. Sars, remarking upon this, observes—"Macula nigra unica minima prope basin antennarum secundi paris, maculæ infraoculari in ceteris Lynceidis simillima, in capite conspicitur; quæ, quum oculus verus compositus in omnibus ceteris Crustaceis

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Cladoceris distinctus omnino absit, organum quamquam rudimentare visus habenda est" (Om de i Omegnen, &c., 1861, p. 23); and in his subsequent memoir on the Fresh-water Crustacea of Norway he thus summarizes his observations on the eye-spot among the Cladocera—

"Un autre organe très répandu dans cet ordre de crustacés, la tache de pigment noire entourée d'un procès qui descend du ganglion du cerveau, a été moins bien compris. Ce n'est que dans ces derniers temps que son importance comme organe incomplet de la vue a été signalée par M. Leydig, qui chez quelques formes a cru y voir de véritables corps lenticulaires, quoique bien faiblement développés. Ce qui donne plus de poids à cette supposition, c'est qu'il existe des formes comme *Monospilus* (nouveau genre des Lyncéides), où le véritable oeil manque complètement et ne saurait être remplacé que par cette tache de pigment. Cette opinion se trouve aussi confirmée lorsqu' on compare ces animaux aux autres crustacés. Ainsi on trouvera facilement que, sous le double rapport de l'apparence et de la situation, cet organe est complètement semblable au soi-disant oeil entomostracéen des larves des Décapodes, découvert par M. Claus. La seule circonstance qui pourrait s'opposer à cette supposition, c'est que chez les décapodes cet organe n'est que provisoire et qu' il disparaît par le développement complet des yeux réunis, tandis que chez les Cladocères cette tache de pigment noire reste toujours; mais cette difficulté se trouve écartée par l'observation de l'auteur sur *Leptodora*, qui, comme on le sait, dans l'état de développement parfait, ne possède aucune trace de cet organe, mais qui, au commencement de son existence, est pourvue d'une tache de pigment assez fortement développée, au même endroit et de la même apparence que celle des autres Cladocères."*

MONOSPILUS TENUIROSTRIS (*Fischer*). Pl. XIX, fig. 2; and Pl. XX, fig. 9.

1854. *Lynceus tenuirostris*, S. Fischer. Bull. de Soc. Imp. des Nat. de Moscou, p. 427. Pl. III, figs. 7–10.

* G. O. Sars Norges Ferskvandskrebsdyr. Første Afsnit Branchiopoda. 1. Cladocera Ctenopoda, p. 7 (1865).

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1861. *Monospilus dispar*, G. O. Sars. Om de i Omegnen af Christ. forkom. Cladocerer, p. 23.

Carapace obovate or subrotund, wider in front than behind, dorsal margin very much arched; posterior margin subtruncate; ventral convex; infero-posteal angle completely rounded off; valves composed of many plates overlapping each other, the smallest not half the size of the largest,* the ventral margin of each of these plates ciliated, head and dorsal portion of carapace rugose, curiously sculptured with sunken pits. Head depressed, very shallow and small, rostrum produced, pointed; compound eye wholly absent; eye-spot present in the usual position at the origin of the anterior antennæ, which are shorter than the rostrum. Posterior antennæ of moderate length, an unusually large and conspicuous spine at the distal extremity of the branch which bears three setæ only; and both branches having the terminal setæ accompanied by a similar but smaller spine. Abdomen short and very deep, superior margin swelling out just beyond the abdominal setæ, and subsequently hollowed out nearer to the widely truncate extremity; furnished with articulated spines varying greatly in size (mostly very minute), and irregularly disposed both on the edge and the sides, and extending quite round the supero-posteal angle, which is completely rounded off; the largest spines are about this angle; terminal claws very powerful, and furnished at their base with a large spine, which is half as long as the claw itself. Length, $\frac{1}{10}$th of an inch.

* In a gathering of Entomostraca from Crag Lough, A. M. N. has found a very considerable number of specimens of *Lynceus elongatus*, in which the carapace consisted of a series of valves lying one over another. It appeared as though the animal, instead of undergoing its usual periodical exuviations, retained the older valves outside the more recently developed envelopes. It is however a puzzling matter for speculation, why the particular examples of *L. elongatus* referred to did not undergo the usual sloughings. Was it that they were in a diseased state, and had not strength to cast their skins? We scarcely think that this can have been the cause, for, if so, it seems improbable that they would have lived, labouring under disease, during the length of time which the uncast carapaces indicated. The state of these specimens differed from that which is usual in *Monospilus tenuirostris* in one particular, viz., that while in the former, the carapaces being all of nearly the same size, show that their retention had not commenced until the animal was fully grown, in the latter the small size of the outermost of the coverings, and the gradually increasing dimensions to the innermost, prove that the skin has not been cast during a considerable period of the animal's growth.

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Discovered for the first time in Great Britain by G. S. B. in East Belsay Lake, Northumberland, and subsequently in South Shaws Loch, Selkirkshire. It is also known in Russia and Norway.

GENUS. ANCHISTROPUS, *G. O. Sars.*

Carapace-valves united almost to the infero-posteal angle, and having a peculiar angular projection rather before the middle of the ventral margin; head of great size, vaulted, and completely covering, not only the anterior, but also the greater portion of the posterior antennæ. First feet in both sexes having a long, cylindrical, falcate process denticulated on the edge, which is very conspicuous, and projects beyond the valves. Eye and eye-spot, excretory orifice, and general structure of abdomen, as in Lynceus.

ANCHISTROPUS EMARGINATUS, *G. O. Sars.* Pl. XIX, fig. 4; and Pl. XX, fig. 4.

1862. *Anchistropus emarginatus*, G. O. Sars. Om de i Omeg. af Christ. forekom. Clad. *Andet Bidrag.*, p. 42.

Carapace very tumid, somewhat semicircular, anterior, dorsal, and ventral margins forming a continuous bold arch, valves united almost to the infero-posteal angle, which is rounded off; ventral margin on the posterior half nearly straight and ciliated; anterior to this is a curious mucronate triangular projection, in front of which the ventral side is terminated by a semicircular protuberance, the angle of the semicircle being towards the ventral margin, and the arc towards the head. Head very large and dome-shaped, concealed beneath which lie, not only the anterior, but also the greater portion of the posterior antennæ; rostrum bent downwards, moderately long, and acute; eye large; eye-spot nearer to the eye than to the extremity of the rostrum; posterior antennæ very short, not extending beyond the rostrum. First feet terminating in both sexes in a conspicuously produced cylindrical falcate process, bearing (five or six) denticulations on the inside towards the distal extremity, and extending beyond

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the valves. Abdomen short and broad, having the supero-posteal angle very greatly produced, so that the claws take their origin at a part considerably removed from the most distal portion of the abdomen, superior margin edged with articulated spines; claws very long and slender, gently curved, and finely pectinated throughout their length, but not having any spine at the base. Length, $\frac{1}{40}$th of an inch.

In the male the first feet are furnished with the peculiar falciform process, and also with a large simple hook, exactly similar in form to the male clasping organ of the same feet in *Lynceus sphæricus*.

Anchistropus emarginatus is a very curious species. It was sent to us, in 1863, by Mr. D. Robertson, who found it in the Paisley Canal, near Glasgow. It had just previously been discovered by Herr G. O. Sars in Norway; but has not, so far as we are aware, been noticed elsewhere.

EXPLANATION OF PLATES.

PLATE XVIII.

Fig. 1. Lynceus elongatus, × 84.
Fig. 2. ,, costatus, × 84.
Fig. 3. ,, exiguus, × 120.
Fig. 4. ,, falcatus, × 100.
Fig. 5. ,, lævis, × 84.
Fig. 6. ,, guttatus, × 100.
Fig. 7. ,, testudinarius, × 84.
Fig. 8. ,, nanus, × 120.
Fig. 9. ,, uncinatus, × 84.

PLATE XIX.

Fig. 1. Lynceus rostratus, × 84.
Fig. 2. Monospilus tenuirostris, × 84.
Fig. 3. Lynceus tenuicaudis, × 84.
Fig. 4. Anchistropus emarginatus, × 84.

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Fig. 5. ,, acanthocercoides (after *Fischer*.)
Fig. 6. ,, personatus, × 84.

PLATE XX.

Fig. 1. Abdomen of Lynceus falcatus, × 400.
Fig. 2. ,, ,, elongatus, × 210.
Fig. 3. ,, ,, tenuicaudis, × 210.
Fig. 4. ,, Anchistropus emarginatus, × 210.
Fig. 5. ,, Lynceus globosus, × 210.
Fig. 6. ,, ,, macrourus, × 400.
Fig. 7. ,, ,, acanthocercoides (after *Fischer*.)
Fig. 8. ,, Eurycercus lamellatus, × 84.
Fig. 9. ,, Monospilus tenuirostris, × 210.

PLATE XXI.

Fig. 1. Abdomen of Lynceus harpæ, × 120.
Fig. 2. ,, ,, macrourus, × 80.
Fig. 3. ,, ,, exiguus, × 320.
Fig. 4. ,, ,, testudinarius, × 210.
Fig. 5. ,, ,, quadrangularis, × 120.
Fig. 6. ,, ,, rostratus, × 260.
Fig. 7. ,, ,, costatus, × 210.
Fig. 8. ,, ,, nanus, × 400.
Fig. 9. ,, ,, truncatus, × 210.
Fig. 10. ,, ,, guttatus, × 210.
Fig. 11. ,, ,, trigonellus, × 210.
Fig. 12. ,, ,, sphæricus, × 210.
Fig. 13. ,, ,, uncinatus, × 210.
Fig. 14. ,, ,, lævis, × 210.

PLATE XXII.

Fig. 1. Bosmina longispina (female), × 84.
Fig. 2. ,, ,, (male), × 84.
Fig. 3. ,, Coregoni, × 100.
Fig. 4. ,, longirostris, × 100.
Fig. 5. Drepanothothrix hamata, × 84.
Fig. 6. ,, ,, anterior antennæ, × 210.
Fig. 7. ,, ,, abdomen, × 210.

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PLATE XXIII.

Fig. 1. Macrothrix roseus, × 84.
Fig. 2. ,, ,, anterior antennæ, × 210.
Fig. 3. ,, ,, abdomen, × 210.
Fig. 4. ,, laticornis, anterior antenna, × 210.
Fig. 5. ,, ,, abdomen, × 210.
Fig. 6. ,, hirsuticornis, anterior antenna, × 210.
Fig. 7. ,, ,, abdomen, × 210.
Fig. 8. Lathonura rectirostris, × 84.
Fig. 9. ,, ,, anterior antenna, × 210.
Fig. 10. ,, ,, abdomen, lateral view, × 210.
Fig. 11. ,, ,, ,, seen from below, × 210.
Fig. 12. ,, ,, marginal plates, × 400.

(The figures in all cases refer to the *female*, except where otherwise stated.)

XXXIII.—*Miscellaneous Notices and Observations.*

Salmon in the Tyne in 1866.—The success of the endeavours which have for some years been made throughout England, to promote the increase of salmon in our rivers, is a subject so interesting to us all, that I venture to send a few facts bearing upon it in the Tyne.

The letter from Mr. Geo. Harkus, superintendent of police for Northumberland, is so intelligent and complete, and so full of interest, that I make no comment on it, except to call attention to the very singular fact recorded in it—of the much larger size of a great number of these late-run fish.

In fact, my own communication amounts merely to an estimation of the number of fish taken in the nets during the open season, and that not quite so statistical and direct as I could have wished; but however, as I believe it to be a close approximation to fact, and that probably nothing nearer can be obtained, I send it.

The take at the two principal fisheries in the Tyne amounted, in 1865, to 56 per cent. of the total quantity taken in the Tyne: in 1866 these two fisheries produced 79 per cent. more than they

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did in 1865. It is probable that the increase on the whole would be in like proportion; and I infer therefore, that (the total of 1865 being six thousand eight hundred and three fish) the total amount of salmon, grilse, and salmon-trout taken in 1866 would be very nearly eight thousand six hundred.—*G. C. Atkinson.*

"Police Office, Alnwick,
"27th February, 1867.

"SIR,

"According to your request on the 23rd instant, relative to taking salmon in North Tyne and Reed, for artificial propagation in the rivers Coquet and Aln, I beg to inform you that my first journey for ova took place on the 29th November last. I commenced to fish the Reed at Woodburn Village, got a number of fish, but very little ova; most of the fish at that time were kelted. On the 30th I commenced at Tarset and fished to Reedsmouth; I found that most of the fish in the Tyne were also kelted. Took altogether in the Tyne and Reed, for two days' fishing, one hundred and twenty-nine salmon and one hundred and three grilse; several of the salmon up to 20 pounds weight, four 30 pounds, and one 40 pounds or upwards. Most of the fish taken in November were small. To have continued to fish at that time would have been a waste of time and money, as I could see no chance of getting anything like a sufficient quantity of ova, therefore I suspended operations, and waited for a fresh run of fish by the next flood. On the 12th December I went again to the Tyne and found the river very much flooded, it having been heavy rain during the night. Went to the Reed, fished five streams between Woodburn and Reedsmouth, got several very fine salmon; twenty-two at one haul, twelve of that number 20 pounds each; but only one small one ripe for our purpose; took altogether on the 12th thirty-seven salmon and sixteen grilse. On the 13th fished from Falstone to Kielder, river very heavy, fish chiefly small, none over 14 pounds: took on the 13th nineteen salmon and forty-one grilse. On the 14th, river still very heavy; took forty-two salmon and twenty-one grilse between Falstone and Bellingham; eleven fish 30 pounds, fourteen 20 pounds: for three days' fishing only got eight thousand ova. On the morning of the 15th, fished Bridgeford stream below Bellingham, got fourteen salmon all above 20 pounds, two upwards of 40 pounds.

"Fished the Reed, near the Railway Bridge, got forty-three fish, (seventeen salmon, twenty-six grilse,) at one haul; seven about 30 pounds, and three 40 pounds.

"Went to Long Waters Stream, below Woodburn Village; got fifty-seven fish (forty-five salmon, twelve grilse,) at one haul, and three times

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that number of fish got past the nets owing to the river being so heavy; twenty-three about 10 pounds, seventeen 20 pounds, five 30 pounds, and one 40 pounds: got altogether about one hundred thousand ova.

"I was very successful this year, as we had not a dead fish in all that we took—five hundred and twenty-three; they all went off as lively as if they had never been in the nets.

"I got a net made very small in the mesh to prevent the fish being injured.

"We got no salmon-trout in the Tyne or Reed last season. Got a fish in the Reed, near Woodburn, about 3 pounds weight; I could not tell what description of fish it was, as I had never seen one like it before: it was in shape like a grilse, dark green on back, light green on side, and white belly; it is not a trout, therefore I think it must be a cross between a salmon and trout, or salmon-trout and brown trout. My leave did not extend to take fish, only ova, otherwise I would have taken it and sent it to Mr. Buckland for his inspection and decision as to what kind of fish it was; however, after it was seen by a number of anglers and others about Woodburn, who were unable to inform me what kind of fish it was, I returned it to the water. It was a female, and full of ova.

"I am, Sir,
"Your obedient Servant,
"GEO. HARKUS,
"SUPERINTENDENT.

"G. C. ATKINSON, ESQ.,
"Wylam Hall,
"Newcastle-on-Tyne."

Food of the Cod and Ling.—The food of fishes is a subject not only of interest to the naturalist, but of great importance, as affecting the supply of fish as food. The presence or absence, in any particular locality, of the ordinary food of any fish, naturally attracts or drives away the fish from that spot. The Crustacea seems to be the chief support of the Cod, though by no means its only food. The following stalk-eyed Crustaceans have been found in the stomachs of the Cod and Haddock. Probably other persons may be able to add to the list. *Achæus Cranchii, Alphæus ruber, Atelecyclus heterodon, Cancer pagurus, Corystes Cassivelaunus, Eurynome aspera, Galathea Andrewsii, Galathea dispersa, Galathea squamifera, Galathea strigosa, Gebia deltura, Gebia stellata, Gonoplax angulata, Hyas coarctatus, Inachus dorsettensis,*

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Inachus dorhynchus, Inachus leptochirus, Munida Rondeletii, Nika Couchii, Nika edulis, Pagurus Bernhardus, Portunus arcuatus, Portunus corrugatus, Portunus marmoreus, Portunus pusillus, Scyllarus arctus, Squilla mantis, Squilla Desmarestii, Stenorhynchus phalangium.

The food of fishes is an interesting study, and one which I commend to the members of our Club. I shall be thankful for any information on the subject. Much may be learnt from inspecting the stomach before it passes to the domain of the cook. —*Rev. R. F. Wheeler, Whitley, North Shields.*

Ballast-hill Flora.—Last summer I was not very successful in detecting many new plants in the ballast, near the Hartlepools, as I have generally done. I can now report the following—*Camelina sativa, Erigeron Canadense, Galium cinereum, Lepidium draba, Trifolium repens*, var. *foliaceum*, which, I think, is the form designated as *Var. phyllanthum* (Seringe), and which he noticed in Switzerland; *Chenopodium viride* (Lin.); some fine plants of *Galega officinalis*, a Spanish plant; also two individuals of the Italian *Trifolium Michelianum* (Savi): the larger of them was a fine and strong plant.—*John Hogg, M.A., &c., Norton House, Jan.* 24, 1867.

Early Appearance of Frogs and Newts.—The mildness of the present month (February) has brought the frogs from their winter quarters much earlier than usual. I noticed the first on the 10th, and many others have been seen astir since. On the 17th, I saw a newt on the footpath crushed (during its nocturnal rambles) by some passing foot.—*Thomas John Bold, Long Benton, Feb.* 25, 1867.

The Humming-bird Hawk Moth.—In this garden (Linden) on Tuesday morning last (May 7th), while walking with the Rev. J. Marshall, of Brenckburn, I had the pleasure to see one of our old friends of 1865, viz., the Humming-bird Moth. We both saw it and watched it for some time feeding from some polyanthus plants. I never heard of the early spring appearance of

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this insect before, and unless I had time enough to be positively certain I should have hesitated to announce it. Monday was unusually hot, and the night very stormy, with nearly an inch of rain.—*C. H. Cadogan, Linden, near Morpeth, May* 9, 1867.

ADDRESS TO THE MEMBERS OF THE TYNESIDE NATURALISTS' FIELD CLUB,

READ BY THE PRESIDENT, THE REV. JOHN COLLINGWOOD BRUCE, LL.D., F.S.A., AT THE TWENTY-FIRST ANNIVERSARY MEETING, HELD IN THE MUSEUM OF THE NATURAL HISTORY SOCIETY, NEWCASTLE-UPON-TYNE, ON THURSDAY, MAY 9TH, 1867.

THE FIRST FIELD MEETING of the season is always a joyous event. It is a manifestation of the fact that the long months of winter are ended—that bright skies have replaced the darkness and the storm—that the time of the singing of birds has come, and that nature has assumed its wonted vitality. At the first gatherings of the year the friendships of former occasions are renewed—each well-remembered face beams with the reminiscence of past enjoyments.

The inaugural meeting of 1866 was a successful one. The weather was most favourable, and the ground selectod for our visit presented scenes of great variety and great beauty. Acklington, the river Coquet, and the castle, hermitage, and church of Warkworth formed the programme of the day. About forty members and their friends (among whom was a most encouraging sprinkling of ladies) joined the expedition. Acklington village and church were visited under the guidance of the Rev. George Thompson, the incumbent of the place, who kindly accompanied us throughout the day and gave us the benefit of his local knowledge. Acklington dam and hatching ponds were carefully examined, and a wish was pretty generally expressed that means more effectual than those which at present exist might be adopted for allowing the *salmo salar* to ascend the river and itself deposit its spawn in breeding grounds of its own selection. The slight

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remains of Brenksheugh church were visited, and afforded some interesting reminiscences of the olden times. Our way next lay over the haughs and banks, and through the woods and tangled brakes of the river Coquet. Although no very rare plants were noticed, the beauty and abundance of those simple wild flowers, which have been the joy of our English spring in every age, were greatly admired. The swallow was by several of our party seen for the first time for the season; and some pretty old school boys started on hearing the curious voice of the cuckoo. Arrived at the hermitage the Rev. Wm. Dunn, vicar of Warkworth, kindly undertook to explain its principal features. He afterwards accompanied the party over the castle and to the church, and pointed out the various changes which at different periods have been effected in these buildings. Through the kindness of Lady Percy, the private rooms in the castle were thrown open to our inspection.

After dinner five members were elected, and a paper was read by the Rev. Wm. Dunn on Bishop Percy's ballad of the Hermit of Warkworth, which formed a fitting and most agreeable conclusion to the day's proceedings.

The Second Meeting of the season took place on Wednesday, June 20th, at Easington, and comprehended a visit to Horden Hall, and a range through Fox Hole Dene and Hawthorn Dene. The previous day having been very wet not many of the members joined the excursion: those who did so, were rewarded by the enjoyment of a ramble presenting numberless features of interest and the most auspicious weather. Going by train to Sunderland our party, which was there increased to fifteen, proceeded to Easington in an open carriage. In the course of the day we were joined by twelve members of the Seaham Club. At Easington the party was very courteously received by the rector, the Rev. Jas. Manisty. He kindly conducted them over the rectory and church, both of which have several features of interest, and hospitably recruited their strength before sending them on their way, an important engagement preventing him from accompanying them in their subsequent rambles.

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In the vestry of the church at Easington is preserved a copy of the Solemn League and Covenant, bound up with the ordinary parish registers. It will be remembered, that by order of the Parliament in 1643, all persons throughout the kingdom of England, above the age of eighteen years, were directed to sign it.

Horden Hall is a building in which the Tudor style is seen to yield to the Jacobean. It contains a fine old staircase and a mantelpiece most exquisitely carved.

On plunging into the recesses of Fox Hole Dene the members had an opportunity of enjoying nature in all its wildness and simplicity. If occasionally a too luxuriant vegetation impeded their progress, or a treacherous footing brought some of them to the ground, they saw the country as God made it, not as man trims it. After having for some time had the prospect closed by surrounding trees and rank brushwood, it was refreshing at length to reach the coast and gaze upon the boundless ocean. After lingering a brief space upon the sea-shore, where the men of the coast-guard service were going through their rocket practice, we plunged into Hawthorn Dene on our way back to Easington, and enjoyed to the full the romantic beauties and botanical riches of this favoured spot. Mr. Pemberton kindly gave us permission to roam at large through his domain, and the Rev. D. M. Cust and Mr. Draper liberally laid their stores of local and scientific information at the service of their companions.

The following list of plants picked up during the day has been furnished by Mr. Draper:—Fly Orchis (*Ophrys muscifera*), Butterfly Orchis (*Orchis bifolia*), Frog Orchis (*Orchis viridis*), narrow-leaved helleborine (*Epipactis ensifolia*), common tway-blade (*Listera ovata*), common star thistle (*Centaurea calcitrapa*), wood crane's bill (*Geranium sylvaticum*), herb Paris (*Paris quadrifolia*), water avens (*Geum rivale*), dyers' weed (*Genista tinctoria*), common butterwort (*Pinguicula vulgaris*), *Lepidium draba;* this plant was found on the ballast at Seaham Station: wild celery (*Apium graveolens*), small marsh valerian (*Valeriana dioica*), stone crop (*Sedum acre*), melancholy thistle (*Carduus heterophyllus*).

The ornithologists of the party had as much reason to be gratified as the botanists, the following birds cheering them by their

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flight or their song:—Cuckoo, Stone-chat (these birds were seen at the blast furnaces, Seaham: about twelve specimens at the lime quarry), Whinchat, Wheatear, Chiff-chaff, Willow-wren, Reed-sparrow or Sedge-warbler.

After dinner five new members were elected, and the following papers read:—

1. "*On a species of Gymnetrus, cast ashore at Seaton Snook*, by John Hogg, Esq., M.A., F.R.S."

2. "*On the Fossils of the Marl-slate and Lower Magnesian Limestone of Durham* (*No.* 2), by James W. Kirkby."

3. "*On the Chemical Composition of various beds of Magnesian Limestone*, by Messrs. E. J. J. Browell and J. W. Kirkby."

4. "*Meteorological Report for* 1865, by Geo. Clayton Atkinson, Esq."

The THIRD MEETING of the year led us to a district of Northumberland seldom visited by towns-people. Notwithstanding the early hour (6·35 A.M.) required for the start, a goodly company (thirty-seven in number, and including several ladies,) assembled at the Central Station. The day was fine but not hot, a gentle breeze rendered exertion agreeable, and occasional clouds, casting their shadows on the hills, gave increased charm to the landscape. Leaving the Border Counties train at Reedsmouth the party, under the guidance of Dr. Charlton and the Rev. John H. Newton, of Cambo, proceeded in the direction of Swine Hill, on the summit of which is a large Roman camp. This was carefully examined, its ramparts being in an excellent state of preservation; the semi-circular traverses attached to its gateways were noticed, a peculiarity of construction which General Ray considers to be peculiar to the encampments of the ninth legion. The line of the Watling Street is close to this camp; along it Agricola doubtless marched on his way into Scotland about the year 80. Passing from these traces of the occupation of Britain by the Romans eighteen hundred years ago, we next approached the spot where, in 1715, Lord Derwentwater appeared in open arms against the house of Hanover. The minds

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of the least imaginative of our party were roused to activity as we passed over ground so rich in historic associations.

The rise of rivers and their onward course is always an interesting subject of investigation. Under the guidance of Mr. Shanks, of Park Head, we traced the origin of the pretty riveret the Wansbeck, and especially noticed it at the point when, not far from its source, it swells into the extensive sheet of water called Sweethope Lough. By the margin of this lake, where the true bulrush abounds, and in the contiguous defiles, the party lingered for some time, procuring here and there botanical and geological specimens of considerable interest, if not of excessive rarity. Next we made for Woodburn. Our course thither lay over the Wanny Crags, from the summit of which a magnificent view was obtained of the Cheviot Hills and the intervening country. In crossing a railway cutting, near Woodburn, an interesting section of the strata of this part of the country was obtained, and the mode in which the ironstone of the district was deposited was studied to advantage under the guidance of Mr. Howse. At Park Head Mr. Shanks described the excavations which had, at various times in his recollection, taken place in the Roman station at Risingham, illustrating his observations by plans and the exhibition of many of the objects of interest which had been found in it. The remains of the Roman sculpture, known as Rob of Risingham, were very carefully scanned, and the famous camp of Habitancum at length reached. Its moats and ramparts, its gateways and streets, were examined with interest; and in places where the turf had been accidentally removed, bones, tiles, pottery, and other relics of the Roman era, were picked up in tolerable abundance. The dinner hour having arrived, the well-supplied table of the host, at Brandy-bank, was surrounded by an appreciative throng.

After dinner Dr. Philipson read a short paper, by Mr. John Hogg, of Norton, "*On the production of a small cone of the Wellingtonia gigantea*," and one new member was elected.

At the Fourth Meeting, which was held on Wednesday, the 15th of August, the Club penetrated into Yorkshire, the object

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being to examine the ironstone beds of Cleveland, the working of which has given so powerful an impulse to the iron trade of the north of England. In consequence of the distance to be traversed it was thought that the number of members joining in it would be very small; owing, however, to the attractiveness of the programme, and the circumstance that the railway companies exercised a greater liberality than usual, the party, before arriving at its final destination, became nearly one hundred strong. Our associate, Mr. Isaac Lowthian Bell, acted throughout the day as our guide and instructor. As we sped upon our course he described the geological features of the country, and in particular pointed out the beds of the Cleveland ironstone as they showed themselves in the neighbouring hills. On leaving the railway we were conducted to the Hob Hill Mine, which, as being the nearest at hand, Messrs. J. and J. W. Pease had, at Mr. Bell's request, kindly thrown open to our inspection. Its galleries were brilliantly illuminated, so that the character of the mineral, and the mode of its extraction, could be studied with facility. Some blasts were discharged, which gave a zest to our visit. Saltburn was next visited, with its beautiful ravine and sylvan glades. The magnificent cliffs which form the shore south of Saltburn were afterwards carefully viewed, and their stratification noted. Several fossils were collected by our party, and specimens of iron scoriæ, resembling those found in the vicinity of Roman camps, were found. At four o'clock a party of ninety-five sat down to the enjoyment of an elegant entertainment, provided for them by Mr. John Bell and his lady, in their beautiful mansion of Rushpool Hall. The repast being over, and our kind entertainers being thanked for their hospitality, the Club adjourned to the spacious greenhouse of the Hall, when business was proceeded with. Here Mr. I. Lowthian Bell read a paper upon the subject which had been the prominent topic of inquiry during the day. He described the circumstances which led to the activity recently witnessed in the Cleveland district, and showed how the mineral riches of its strata had lain dormant until the necessities of the country demanded its use, and the achievements of science rendered its reduction economically

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possible. Let us hope, that in all departments of our national industry new sources of supply may arise when the moment of need occurs.

Fifteen new members were elected on this auspicious occasion, and the return home was pleasantly accomplished.

Perhaps the most formidable excursion of the season was that which occupied the 13th and 14th days of September, the district visited being the border region of Northumberland, in the vicinity of Otterburn and Chattlehope. Leaving Newcastle at an early hour in the morning, the representatives of the Club were met at Woodburn Station by the Rev. Timothy Wearing, and the Rev. James Christie, of Otterburn, and conducted by a route of great pictorial as well as geological interest, to the Silver Nut Well at Meadow Haugh. A spring which here bubbles to the surface has, from a period of unknown antiquity, continuously brought up, from a stratum lying below, hazel nuts slightly coated with sulphuret of iron. Some specimens of these were procured, giving rise to various speculations as to the time when they were deposited in their present bed. After partaking of the liberal hospitality of Thos. James, Esq., of Otterburn Tower, the party proceeded through the pretty village of Otterburn to the heights on which the battle of Otterburn was fought. Here they enjoyed the instructive guidance of Mr. Robert White, who, in his history of the Battle of Otterburn, has told the tale of that celebrated fight in a way which leaves nothing to be desired. The Roman station of Bremenium, and the Roman tumuli by the side of the Watling Street, formed the closing investigations of the day. A party of twenty-two sat down to dinner at the Horsley inn. After the abundant and much-needed meal had been dispatched, the Rev. James Christie read a paper entitled, "*Reedwater in Ancient and Modern Times*," and Mr. Robert White, drawing upon the abundant stores of his youthful reminiscences, gave a striking picture of the habits and amusements of the people of that district half-a-century and more ago. Those of the party who were to return to Newcastle that evening then procured conveyances by which they were taken back to the

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Woodburn Station. The day throughout was cloudy, but no rain fell.

The principal object of attraction next day was the celebrated waterfall, Chattlehope Spout. Happily abundant rain had fallen in the night, and numerous heavy showers kept up a supply of water during the day. The waterfall was seen to great perfection. In the crag over which the water falls the peregrine falcon used to breed, and the raven still makes its nest. Procuring conveyances the party next pressed on to the summit of Carter Fell, and looked down upon the broad and fertile plains of Scotland. Seldom, probably, has the scene been witnessed under circumstances of greater grandeur. At the hospitable mountain-home of Mr. Dodd, of Catcleugh, the members of the Club were kindly supplied with dry clothing and abundantly refreshed.

Throughout both days the Club enjoyed the valuable services of Mr. Lawson, of Rédesdale Cottage, whose knowledge of the country is complete.

Two members were on this occasion added to the Society.

The usual SUPPLEMENTAL MEETING, at Marsden, took place on Friday, the 5th October. About forty members of the Club were met at Cleadon by the Rev. G. C. Abbes, and escorted by him through his well-arranged grounds. The Cleadon Water Works were visited, and the famous Lizard Pond was searched, not without success, for microscopical objects. An agreeable stroll upon the beach, and a fresh examination of those grand cliffs, which can never be seen but with astonishment, brought on the hour for the necessary refreshment.

Tea being over, Mr. G. S. Brady read a paper on "*The Variations of certain Crustacea, with reference to Darwin's Theory of the Origin of Species;*" and eight new members were elected.

It is unnecessary to refer to the WINTER EVENING MEETINGS of the Club. Numerous and important papers have been read, and much pleasant intercourse enjoyed.

The great loss which the students of Natural History have sustained, in the decease of our friend and associate, Mr. Alder,

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has already received notice. The truthful and simple memorial of his life, from the pen of Dr. Embleton is a document which will give value to the forthcoming part of the Transactions of the united Societies. And yet, a more substantial memorial is demanded. A scheme has been resolved on which will tend at once to hold in prominent remembrance the memory of the great naturalist, and to promote the study to which the energies of his life were devoted. The members of the TYNESIDE CLUB and the NATURAL HISTORY SOCIETY are not persons to resolve and not perform. During Mr. Alder's life-time we all felt exalted in his exaltation—let us each add at least one stone to the cairn that shall tell to subsequent generations the services and the worth of our departed associate.

And now I resign the high office which I have held during the last twelvemonths. I confess I accepted it without duly reflecting upon the brilliant qualifications of most of those who had preceded me. No one can have been so conscious as I have been of my inability rightly to discharge its duties, but I may venture to say, that every effort that I could put forth for the benefit of the Club has been most willingly rendered.

The members of the Club are, I believe, more numerous now than they ever were. May they continue to increase! and may the TYNESIDE NATURALISTS' FIELD CLUB in the future, even more than in the past, be the means of promoting an intimate acquaintance with the marvellous works of our God—of promoting the health and happiness of its members, and of nurturing a spirit of harmony, kindness, and charity amongst all with whom we are brought in contact.

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THE FIELD MEETINGS for 1867 were arranged to be held as follows:—

MAY	Cawsey Dene.
JUNE	Hexham and Dipton.
JULY	Raby.
AUGUST	Longhoughton and Dunstanborough.
SEPTEMBER	Birtley (North Tyne).
OCTOBER	Marsden.

THE Treasurer's report (see p. 424) was read and adopted.

THE following gentlemen were elected officers of the Club for the year 1867–8:—

PRESIDENT.

The Rev. Angus Bethune, M.A.

VICE-PRESIDENTS.

G. C. Atkinson, Esq.
Richard Howse, Esq.
John Hancock, Esq.
Thomas John Bold, Esq.

Ralph Carr, Esq.
Rev. J. F. Bigge, M.A.
D. Embleton, Esq., M.D.
R. Ingham, Esq., M.P.
Sir W. C. Trevelyan, Bart.
T. Sopwith, Esq., F.R.S.
Rowland Burdon, Esq.
J. Hogg, Esq., F.R.S.
Rev. H. B. Tristram, M.A.
George Wailes, Esq.
Rev. W. Greenwell, M.A.
Edward Charlton, Esq., M.D.
Rev. G. C. Abbes, M.A.
Rev. A. M. Norman, M.A.
Rev. J. C. Bruce, LL.D.

TREASURER.

Robert Y. Green.

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SECRETARIES.

George S. Brady. | Thomas Thompson.
G. H. Philipson, M.D.

LOCAL SECRETARIES.

Shields, W. H. Brown. | *Hexham*, Rev. W. T. Shields.
Durham, John Booth. | *Morpeth*, W. Creighton.

COMMITTEE.

Joseph Blacklock. | John Daglish.
E. J. J. Browell. | James W. Dees.
D. O. Brown. | William Dinning.
R. B. Bowman. | Albany Hancock.
H. B. Brady. | George Hodge.
James Clephan. | G. C. Pecket, Jun.

AUDITORS.

J. S. Foster. | T. P. Barkas.

THE following gentlemen have been elected members of the TYNESIDE NATURALISTS' FIELD CLUB during the past year:—

At the ANNIVERSARY MEETING, 1866:—Messrs. Thomas Hall, Winlaton; E. S. Fell, Biddick; Robert Eadie, Blaydon; Ralph Scott and C. H. Young, Newcastle; John Holdsworth, Houghton-le-Spring.

At the FIRST FIELD MEETING:—Messrs. R. H. Wilson, Gateshead; George Reid and J. A. Philipson, Newcastle; G. B. Morgan, Bishopwearmouth.

At the SECOND FIELD MEETING:—Messrs. W. B. Reid and W. C. Carr, Newcastle; Arthur Iliff, John Robinson, and F. K. Campbell, Sunderland.

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At the THIRD FIELD MEETING:—Mr. Wm. J. Watson, Bensham Grove.

At the FOURTH FIELD MEETING:—Messrs. William Clephan, Stockton; C. H. Cadogan, Brinckburn Priory; T. L. Gooch, Saltwell; D. P. Huntley, F. Dixon, and W. H. Pearson, jun., Sunderland; Thos. Lomas, South Shields; P. E. Mather, W. M. Richardson, and Geo. Barry, Newcastle; Rev. T. H. Pattison, Gateshead; Robt. Stephenson, Middlesbro'; Edw. Wood, F.G.S., Richmond, Yorkshire; Jos. Wilson, Cleadon Hall; John Waite, jun., North Shields.

At the FIFTH FIELD MEETING:—Messrs. J. Wilson, Sunderland; J. Jones, F.G.S., Middlesbro'.

At the SIXTH FIELD MEETING:—Messrs. James Wait, jun., and John Short, North Shields; Joseph Wright, jun., and Thos. Lincoln, South Shields; Henry Watson, Newcastle; J. Hope and William Byers, Sunderland; Walter Curle, Monkton.

At the FIRST EVENING MEETING:—Messrs. Thomas W. Backhouse and James Edward Backhouse, Sunderland.

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THE TREASURER IN ACCOUNT WITH THE TYNESIDE NATURALISTS' FIELD CLUB.

Dr.				Cr.			
1866.	£	s.	d.	1866.	£	s.	d.
To Balance brought forward	28	8	6	By Printing Transactions	50	4	0
" Subscriptions and Entrance Fees	136	10	0	" Printing Circulars, &c.	13	3	6
" Natural History Society, half Expenses of separate Copies of Papers	1	14	0	" Plates, &c.	13	0	0
				" Commission for collecting	6	7	9
" One Hundred and Fifty Copies of Transactions, at £8 2s. 6d. per Hundred	12	3	9	" Postage	15	12	8
				" Sundries	7	19	1
" Sale of Transactions	2	6	5	" Balance	74	15	8
	£181	2	8		£181	2	8

May 9th, 1867,

Examined and found correct,

(Signed) T. P. BARKAS, JOHN BURNUP, JUN., } AUDITORS.

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TYNESIDE NATURALISTS' FIELD CLUB.

LIST OF MEMBERS, MAY 9TH, 1867.

Abbes, Rev. George Cooper, B.A. ..... Cleadon Lane.
Abbes, Henry ..... Rock Lodge, Roker.
Abraham, John..... Liverpool.
Adamson, Charles M. ..... Newcastle.
Adamson, William..... Newcastle.
Adamson, Charles A. ..... North Shields.
Adamson, Henry ..... North Shields.
Adamson, Horatio ..... North Shields.
Alcock, Samuel, jun. ..... Sunderland.
Allison, J. G. ..... Newcastle.
Anderson, Joseph ..... Newcastle.
Anderson, Charles..... South Shields.
Appleton, J. R..... Durham.
Armstrong, George ..... Newcastle.
Armstrong, Hugh C. ..... Newcastle.
Armstrong, Luke, M.R.C.S. ..... Newcastle.
Armstrong, Leonard..... South Shields.
Atkin, David ..... Newcastle.
Atkinson, George C..... Wylam Hall.
Atkinson, J. Ismay, M.R.C.S. ..... Wylam.
Atkinson, Henry ..... Newcastle.
Atthey, Thomas ..... Gosforth Colliery.

Backhouse, William ..... St. John's, Wolsingham.
Backhouse, Edward ..... Sunderland.
Backhouse, James Edward ..... Sunderland.
Backhouse, Thomas William ..... Sunderland.
Bainbridge, Emerson M. ..... Durham.
Bainbridge, William, jun. ..... South Shields.
Baker, J. G. ..... Royal Gardens, Kew.
Barkas, Thomas P. ..... Newcastle.

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Barkus, Benjamin, M.D. ..... Gateshead.
Barnes, J. W. ..... Durham.
Barron, James ..... Sunderland.
Barry, George ..... Newcastle.
Bass, Charles..... Gateshead.
Bates, J. P. ..... North Shields.
Bell, Henry ..... Newcastle.
Bell, Isaac Lowthian ..... Newcastle.
Bell, John Thomas ..... Monkwearmouth.
Bell, Robert ..... South Shields.
Belt, Thomas..... Newcastle.
Benning, Edward ..... Riding Mill.
Benson, William ..... Allerwash House.
Bethune, Rev. Angus ..... Seaham Harbour.
Bewicke, Thomas J..... Allenheads.
Bigge, Rev. J. F., M.A. ..... Stamfordham Vicarage.
Bigge, Rev. G. R..... Ovington Rectory.
Blackett, W. C..... Durham.
Blacklock, Joseph..... Newcastle.
Blain, Thomas ..... Sunderland.
Blagden, Rev. A. J. ..... Houghton-le-Spring.
Bold, Thomas John ..... Long Benton.
Bolton, Andrew, M.D. ..... Newcastle.
Booth, George R. ..... Sunderland.
Booth, John ..... Durham.
Bourne, William, M.A., M.D..... North Shields.
Bowman, Hugh..... Gateshead.
Bowman, H. O., M.D..... Sunderland.
Bowman, R. B..... Newcastle.
Bowman, Walter ..... Gateshead.
Boyd, Edward F. ..... Durham.
Brady, George S., M.R.C.S. ..... Sunderland.
Brady, Henry B., F.L.S. ..... Newcastle.
Bramwell, J., M.D. ..... North Shields.
Branford, W. E. ..... Newcastle.
Brice, Rev. George ..... Humshaugh.
Briggs, R. S..... Sunderland.
Brignell, William ..... Durham.
Brooks, J. C..... Wallsend.
Brogden, James Edward ..... Hetton-le-Hole.
Broomfield, Thomas ..... Newcastle.
Browell, Edmund J. J. ..... East Boldon.
Brown, Drewitt O. ..... Jarrow Hall.

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Brown, John ..... Newcastle.
Brown, John ..... Newcastle.
Brown, Philip, M.D. ..... Blaydon-on-Tyne.
Brown, Thomas W. ..... Sunderland.
Brown, W. H. ..... North Shields.
Browne, Joseph Laing ..... North Shields.
Bruce, Rev. John C., LL.D., F.S.A. ... Newcastle.
Bruce, Gainsford ..... London.
Brummell, G. A. ..... Newcastle.
Buck, Robert ..... Sunderland.
Bullen, Mark W. ..... Blyth.
Bulman, George ..... Newcastle.
Burdon, Rowland ..... Castle Eden.
Burnett, Rev. W. R. ..... Newcastle.
Burnett, Jacob ..... Tynemouth.
Burnup, John, jun. ..... Newcastle.
Burnup, Martin, M.D. ..... Newcastle.
Burrell, R. A. ..... Durham.
Byers, William ..... Sunderland.

Cadogan, C. H. ..... Brinckburn Priory.
Cail, Septimus A. ..... Newcastle.
Candlish, John, M.P. ..... Sunderland.
Calvert, Thomas ..... Durham.
Campbell, Thomas H. ..... Sunderland.
Carr, Rev. H. B., M.A. ..... Whickham.
Carr, John ..... North Shields.
Carr, Ralph ..... Hedgeley.
Carr, William Cochrane ..... Scotswood Road.
Challoner, J. S. ..... Newcastle.
Charlton, Edward, M.D. ..... Newcastle.
Charlton, William Henry ..... Hesleyside.
Charlton, William ..... Newcastle.
Chartres, William ..... Newcastle.
Clapham, Robert Calvert... ..... Walker.
Clay William ..... Newcastle.
Clayton, John ..... Newcastle.
Clemence, Thomas M. ..... South Shields.
Clephan, James ..... Newcastle.
Clephan, Joseph ..... Newcastle.
Clephan, Robert C. ..... Newcastle.
Clephan, William ..... Stockton.
Cockcroft, L. M. ..... Newcastle.

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Cooke, Jonathan ..... Newcastle.
Cooke, Thomas ..... Newcastle.
Cooper, George ..... Newcastle.
Coppin, John ..... North Shields.
Cowen, J. A. ..... Blaydon Burn.
Cowen, Joseph, jun. ..... Stella House.
Coxon, S. B. ..... Usworth Hall.
Cox, J. H. ..... Sunderland.
Craggs, Thomas ..... West Cramlington.
Crawshay, Edmund ..... Bensham.
Crawhall, George Edward ..... Durham.
Creighton, William ..... Morpeth.
Cresswell, Rev. Samuel F. ..... Lancaster.
Crolley, Rev. James ..... Newcastle.
Crooks, St. John ..... Sunderland.
Crossling, Thomas ..... Newcastle.
Culley, M. T. ..... Copeland Castle.
Cundill, Rev. James ..... Muggleswick.
Curle, Walter ..... Monkton.

Daggett, William ..... Newcastle.
Daglish, John ..... Belmont Hall.
Dale, Henry ..... North Shields.
Dale, J. B. ..... South Shields.
Dance, Thomas William ..... Gateshead.
Davidson, Andrew M. ..... Newcastle.
Davidson, James ..... Newcastle.
Davidson, Joseph ..... Newcastle.
Davis, Robert, M.R.C.S. ..... Wrekenton.
Davison, Edwin C. ..... Sunderland.
Dawson, Blaydon ..... Westoe.
Dawson, Thomas J. ..... Ferry Hill.
De Mey, W. F., M.D. ..... Newcastle.
Dees, James W. ..... Wallsend.
Dees, Robert R. ..... Newcastle.
Denham, John S. ..... South Shields.
Dickinson, J. G. ..... Newcastle.
Dickinson, Robert ..... Newcastle.
Dickinson, William ..... Newcastle.
Dickson, William ..... Alnwick.
Dinning, William ..... Gateshead.
Dixon, A. W. ..... Seaham Harbour.
Dixon, Francis ..... Sunderland.

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Dixon, Henry ..... Sunderland.
Dixon, William ..... Sunderland.
Dixon, Waynman ..... Newcastle.
Dixon, W. H., M.D. ..... Sunderland.
Dodd, J. P., LL.D. ..... North Shields.
Dodds, C. H. ..... Sunderland.
Dodds, M. S. ..... Gateshead.
Dodds, Patrick A. ..... North Shields.
Dodgson, Thomas Steele ..... Whitehaven.
Dodsworth, Frederick ..... Newcastle.
Donkin, A. S., M.D. ..... Sunderland.
Donkin, Richard ..... North Shields.
Donkin, William G. ..... Hexham.
Douglas, James ..... Winlaton.
Douglas, John ..... Gateshead.
Downie, Henry ..... Newcastle.
Draper, Robert ..... Seaham Hall Gardens.
Dunn, Archibald M. ..... Newcastle.
Dunn, William, jun. ..... Newcastle.
Dwarris, Rev. Brereton E. ..... Bywell.

Eadie, Robert ..... Blaydon-on-Tyne.
Eglinton, James ..... Boldon.
Elwin, Robert ..... Sunderland.
Embleton, Dennis, M.D. ..... Newcastle.
Emerson, Rev. T. ..... Allendale Vicarage.
Emmerson, H. H. ..... Stocksfield.
Emmerson, W. L., M.D. ..... North Shields.
Eno, J. Crossley ..... Newcastle.
Evans, Edward ..... Sunderland.

Falconar, J. B. ..... Newcastle.
Fawcus, John ..... North Shields.
Featherstonhaugh, Albany ..... Roker.
Featherstonhaugh, Edward ..... Roker.
Featherstonhaugh, Rev. W., M.A. ..... Edmondbyers.
Fell, Edmund Septimus ..... Biddick.
Fell, H. B. ..... Biddick.
Fenwick, George ..... North Shields.
Fenwick, George Wallace ..... Newcastle.
Fenwick, John, F.S.A. ..... Riding Mill.
Fenwick, John ..... North Shields.
Fenwick, John C. ..... Newcastle.

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Fenwick, John W. ..... North Shields.
Finch, Rev. T. ..... Morpeth.
Fitzgerald, W. R. ..... Durham.
Forrest, William ..... Newcastle.
Forster, George Baker ..... Backworth.
Forster, James ..... Gateshead.
Forster, John ..... Winlaton.
Forth, Robert ..... North Shields.
Foster, Robert ..... Newcastle.
Fothergill, Thomas ..... Bishop Auckland.
Fox, Henry E. ..... London.
Frain, Joseph, M.D. ..... South Shields.
Francis, Matthew, M.R.C.S. ..... Sunderland.
Frazer, Alexander ..... Bristol.
Frazer, Donald ..... Newcastle.
Frazer, Hugh ..... Newcastle.

Garrett, John ..... Newcastle.
Geake, Rev. Augustine ..... Willington Rectory.
Gibb, C. J., M.D. ..... Newcastle.
Gibson, Charles, M.D. ..... Newcastle.
Gibson, George, M.D. ..... Birtley.
Gilchrist, G. C. ..... Newcastle.
Glaholm, J. P. ..... Newcastle.
Glendinning, John ..... Newcastle.
Glover, John ..... Newcastle.
Glynn, Edward, jun. ..... Newcastle.
Goddard, D. H. ..... Newcastle.
Gooch, Thomas L. ..... Saltwell.
Gourley, Rev. G. March ..... Blanchland.
Gowland, G. ..... Sunderland.
Graham, John, jun. ..... Sunderland.
Greaves, John ..... Newcastle.
Green, Charles H. ..... South Shields.
Green, Edward ..... Newcastle.
Green, R. Y. ..... Newcastle.
Green, Rev. T. R., M.A. ..... Newcastle.
Green, Rev. G. E. ..... Boldon.
Green, Rev. Robert ..... Long Horsley.
Green, William, jun. ..... Newcastle.
Greener, Martin ..... Sunderland.
Greenwell, Francis ..... Durham.
Greenwell, Robert ..... Newcastle.

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Greenwell, Rev. W., M.A. ..... Durham.
Greenwell, Rev. W. ..... Horton Parsonage.
Grey, Charles Grey ..... Dilston.
Grey, Hon. and Rev. John ..... Houghton-le-Spring.

Hall, James ..... Newcastle.
Hall, John ..... Newcastle.
Hall, George ..... Newcastle.
Hall, Rev. George R. ..... Birtley, near Wark.
Hall, Thomas ..... Winlaton.
Halton, John ..... Carlisle.
Hamilton, James ..... Sunderland.
Hancock, Albany ..... Newcastle.
Hancock, John ..... Newcastle.
Hanwell, William ..... Hull.
Hardcastle, W. J. ..... Newcastle.
Hare, John ..... Newcastle.
Hardy, H. G. ..... Byers Green.
Harris, Charles ..... Newcastle.
Harrison, John A. ..... Thornley House.
Haswell, F. R. N. ..... North Shields.
Havelock, Michael ..... Newcastle.
Headlam, Rt. Hon. T. E., M.P. ..... London.
Heald, Joseph ..... Newcastle.
Healy, Rev. Edward ..... Bishop Auckland.
Heckels, Richard ..... Pensher House.
Hedley, Thomas F. ..... Sunderland.
Hedley, W. H. ..... Medomsley.
Henderson, M. ..... Newcastle.
Henderson, Robert ..... Newcastle.
Henderson, William ..... Durham.
Henzell, W. M. ..... Newcastle.
Hicks, John M. ..... Gateshead.
Hills, James ..... Sunderland.
Hinde, Rev. J. S. E. ..... Ovington.
Hobkirk, William ..... Cramlington Colliery.
Hodge, George ..... Jesmond.
Hodgson, James ..... Newcastle.
Hodgkin, Thomas ..... Newcastle.
Hodgson, William ..... Darlington.
Hogg, John, M.A., F.R.S., F.L.S. ..... Norton.
Holmes, W. H. ..... Bensham.
Hooppell, Rev. R. E., M.A. ..... South Shields.

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Hope, John ..... Sunderland.
Houen, A. C..... Newcastle.
Howse, Richard..... Newcastle.
Hoyle, J. T. ..... Newcastle.
Holdsworth, John..... Houghton-le-Spring.
Hudson, R. Milbank..... ..... Sunderland.
Hughes, T. W. ..... Newcastle.
Humble, Thomas, M.D. ..... Newcastle.
Hunt, A. H. ..... Birtley.
Huntley, David P. ..... Sunderland.
Hunton, Christopher..... North Shields.
Hutchinson, Cuthbert ..... Whitburn.
Hutchinson, Edward..... Newcastle.
Hutchinson, Joseph ..... Durham.

I'anson, James, jun..... Darlington.
Iliff, Arthur ..... Sunderland.
Iliff, Rev. G. ..... Sunderland.
Ingham, Robert, M.P. ..... Westoe.
Innes, W. H..... Newcastle.
Irving, George ..... Newcastle.

Jackson, Thomas ..... North Shields.
Jackson, Thomas, jun..... North Shields.
Johnston, Robert J. ..... Newcastle.
Jones, John ..... Middlesbro'.

Kaye, William ..... Newcastle.
Kelman, William ..... Sunderland.
Kennedy, J. F. ..... Newcastle.
Kewney, George ..... North Shields.
Kidson, John..... Sunderland.
Kimpster, William ..... Gateshead.
Kirkby, J. W. ..... Etherley.
Kirwood, Rev. R. ..... Chester-le-Street.
Knothe, Rudolph ..... Newcastle.
Kyle, Gibson ..... Newcastle.

Lambert, Mark W. ..... Newcastle.
Latham, William B. ..... Birtley Hall Gardens.
Lawson, Alexander, B.A. ..... Seaton Carew.
Lawson, Rev. Edward ..... Longhurst Hall.
Leathart, James ..... Newcastle.
Lee, Matthew ..... Hexham.

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Legge, John ..... Houghton-le-Spring.
Legge, Lewis C. ..... Houghton-le-Spring.
Leife, Rev. J. E. ..... Cresswell.
Leitch, Thomas Carr ..... North Shields.
Lincoln, Thomas ..... South Shields.
Lindsay, George ..... Sunderland.
Lister, Clement ..... Newcastle.
Logan, William ..... Bishop Auckland.
Lomas, Thomas ..... South Shields.
Lord, John Chapman ..... Sunderland.
Lowrey, Edward ..... Newcastle.
Lowrey, Richard ..... Newcastle.
Luckley, George ..... Newcastle.
Lyall, George ..... South Shields.

Macallum, R. B. ..... Newcastle.
Macdonald, James M. ..... Newcastle.
Maclennan, Rev. Alexander ..... Sunderland.
Magnay, Charles ..... Settingstones.
Maling, C. T. ..... Ouseburn.
Maling, E. A., M.R.C.S. ..... Sunderland.
Maling, William ..... Newcastle.
Manson, Richard T. ..... Heighington.
Marrecco, A. F. ..... Newcastle.
Marsters, John ..... Sunderland.
Marshall, F. C. ..... Jarrow.
Mason, Rev. J. M. ..... Whitfield Rectory.
Mason, Rev. John ..... Witton-le-Wear.
Mather, Edward ..... Newcastle.
Mather, John ..... Newcastle.
Mather, Philip Edward ..... Newcastle.
Maughan, Rev. S. B. ..... Morpeth.
Mawson, John ..... Newcastle.
May, George ..... North Hetton Colliery.
Maxwell, E. ..... South Shields.
Matthew, George, jun. ..... Sunderland.
McAllum, Charles O. ..... Newcastle.
McChesney, J. H. ..... Newcastle.
McLean, Hugh, M.D. ..... Corbridge.
Messent, Philip C. E. ..... Tynemouth.
Meynell, E. J. ..... Durham.
Moffatt, William ..... North Shields.
Morgan, G. B. ..... Sunderland.

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Moody, Rev. Clement ..... Newcastle.
Moor, William Turner ..... Newcastle.
Moore, A. J. ..... Sunderland.
Moore, G. S. ..... Monkwearmouth.
Moore, John ..... Sunderland.
Moore, John ..... Durham.
Moore, J. M. ..... South Shields.
Moore, William ..... Sunderland.
Morrison, David P. ..... Pelton.
Morton, Rev. Henry ..... Thorpe Rectory.
Mounsey, Edward ..... Denham.
Mowbray, C. M. ..... Newcastle.
Murray, William, M.D. ..... Newcastle.
Muschamp, William ..... Gateshead.

Nesham, T. C. ..... Newcastle.
Nesbitt, George ..... Newcastle.
Newall, R. S. ..... Ferndene, Gateshead.
Newbiggin, George ..... Bensham.
Newton, Rev. J. H., B.A. ..... Cambo.
Nichol, Richard ..... Newcastle.
Nicholson, William ..... Winlaton.
Noble, Captain Andrew ..... Elswick.
Norman, Rev. Alfred Merle, M.A. ..... Newbottle.

O'Brien, W., M.D. ..... South Shields.
Ogilvie, Joseph ..... North Shields.
Oliver, William A. ..... Sunderland.

Pattinson, J. ..... Newcastle.
Pattison, Rev. T. H. ..... Gateshead.
Pauling, Robert ..... Pandon Dene House.
Peacock, Reginald ..... Sunderland.
Peacock, Septimus ..... Sunderland.
Pearse, William ..... Fenham Hall.
Pearson, William ..... Newcastle.
Pearson, W. H., jun. ..... Sunderland.
Peart, Septimus, M.D. ..... North Shields.
Pecket, G. C. ..... Sunderland.
Pecket, G. C., jun. ..... Sunderland.
Pemberton, R. L. ..... The Barnes, Sunderland.
Philipson, G. H., M.D. ..... Newcastle.
Philipson, John ..... Newcastle.

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Philipson, Joseph A..... Newcastle.
Philipson, Leonard W..... Newcastle.
Pilkington, Edward ..... Sunderland.
Plummer, Benjamin, jun. ..... Newcastle.
Plummer, Robert ..... Newcastle.
Poole, Henry J..... Blaydon-on-Tyne.
Popplewell, John ..... North Shields.
Potter, Addison..... West Chirton.
Potter, Edward ..... Tynemouth.
Potts, R. H. ..... Sunderland.
Potts, Thomas F. ..... Newcastle.
Proctor, B. S. ..... Newcastle.
Proctor Matthew ..... Killingworth.
Proctor, N. Henry ..... Tynemouth.
Proctor, W. H. ..... Newcastle.
Prosser, Thomas ..... Newcastle.
Punshon, N. ..... Newcastle.

Ramsay, John Taylor ..... Walbottle Hall.
Ranson, Thomas William..... Sunderland.
Ray, Thomas..... Sunderland.
Reay, John..... Sunderland.
Redmayne, J. M. ..... Newcastle.
Redmayne, R. R. ..... Newcastle.
Reed, J. R. ..... Sunderland.
Reid, David, jun. ..... Newcastle.
Reid, George ..... Newcastle.
Reid, W. B. ..... Newcastle.
Richardson, Edward..... Newcastle.
Richardson, J. G. ..... Sunderland.
Richardson, J. Myers ..... Newcastle.
Richardson, Thomas, Ph.D. ..... Newcastle.
Richardson, W. H. ..... Monkton Lodge.
Ridley, Andrew..... Newcastle.
Ridley, Samuel ..... Newcastle.
Ridley, W. B. ..... Newcastle.
Robertson, William Law ..... Durham.
Robinson, George..... Hexham.
Robinson, John..... Sunderland.
Robinson, T. W. U. ..... Houghton-le-Spring.
Robinson, W. S. ..... Sunderland.
Robson, Arthur..... Sunderland.
Robson, E. C. ..... Sunderland.

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Robson, Frederick..... Newcastle.
Robson, J. B. ..... Newcastle.
Robson, Ralph .... Hexham.
Robson, R. N. ..... Durham.
Robson, S. S..... Sunderland.
Robson, William ..... Newcastle.
Robson, W. C. ..... Newcastle.
Rolf, A. G., M.R.C.S. ..... Gateshead.
Ryder, William ..... Newcastle.

Sample, Thomas ..... Bothal Castle.
Sankey, Rev. Philip, M.A. ..... Gateshead.
Scholefield, Henry..... .. Low Heaton House.
Scott, Ralph ..... Newcastle.
Scott, Stephen ..... Newcastle.
Shaw, Frederick ..... Marsden Cottage, So. Shields.
Shiel, George..... Sunderland.
Shield, G. R. ..... Newcastle.
Shield, John, jun. .... Newcastle.
Shields, John..... Durham.
Shields, Rev. W. T. ..... Westburn Cottage.
Shooter, Rev. Joseph ..... North Shields.
Short, John ..... North Shields.
Shotton, Edward ... . North Shields.
Sidney, Henry ..... Morpeth.
Sidney, W. H. M..... Cowpen Hall.
Simey, Ralph..... Sunderland.
Simpson, J. B. ..... Hedgefield.
Skipsey, Rev. R., B.A..... ..... Sunderland.
Small, T. O. ..... Newcastle.
Smart, Colin .... Sunderland.
Smiles, Henry ..... Newcastle.
Smith, Joseph ..... Sunderland.
Sopwith, T., F.R.S.. F.G.S. ..... London.
Sopwith, Thomas, jun..... Allenheads.
Spence, Joseph ..... North Shields.
Spence, J. F..... North Shields.
Spence, J. F., jun. ..... North Shields.
Spence, Robert ..... North Shields.
Spence, Thomas ..... North Shields.
Spencer, Michael ..... Newburn.
Spencer, Thomas ..... Ryton.
Stanger, J..... Newcastle.

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Stephens, Thomas, M.D. ..... North Shields.
Stephens, Thomas, jun. ..... North Shields.
Stevenson, Alexander S. ..... Tynemouth.
Stevenson, Archibald ..... South Shields.
Stevenson, J. A. ..... Gateshead.
Stevenson, Robert..... Middlesbro'.
Stobart, H. S. ..... Whitton Tower.
Stokoe, George, M.D. ..... South Shields.
Stokoe, Thomas..... Newcastle.
Stobart, W. C. ..... Etherley.
Stout, George ..... South Shields.
Straker, John ..... Tynemouth.
Street, Rev. J. C. ..... Newcastle.
Sutherland, B. J. ..... Newcastle.
Sutherland, Robert ..... North Shields.
Swallow, John ..... West Harton.
Swallow, John, jun. ..... West Harton.
Swan, Joseph..... Newcastle.
Swan, J. W. ..... Newcastle.
Swanston, William .... Newcastle.
Swithenbank, G. E. ..... Newcastle.

Tate, George, F.G.S. ..... Alnwick.
Tate, R. M. ..... North Shields.
Taylor, John ..... Newcastle.
Taylor, Rev. Robert ..... Monk-Heselden.
Taylor, Robert ..... Sunderland.
Taylor, William N. ..... Ryhope.
Temperley, Nicholas..... Newcastle.
Temperley, W. A. ..... Hexham.
Tennant, Henry..... Newcastle.
Thackray, William, jun. ..... Sunderland.
Thiedemann, Rudolph ..... Newcastle.
Thompson, C., jun. ..... Winlaton.
Thompson, George ..... Winlaton.
Thompson, John T. ..... Winlaton.
Thompson, J. R. ..... Newcastle.
Thompson, Rev. F. B. ..... Benfieldside.
Thompson, Rev. R. ..... Shotley Bridge.
Thompson, Thomas ..... Winlaton.
Thompson, Thomas ..... Sunderland.
Thubron, Robert ..... Tyne Docks.
Tidswell, William ..... Newcastle.

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Tilley, J. B., jun. ..... Sunderland.
Tone, J. C. ..... Sunderland.
Tone, William ..... Sunderland.
Tone, William, jun. ..... Sunderland.
Trevelyan, Sir Walter C. ..... Wallington.
Tristram, Rev. H. B., F.L.S. ..... Greatham.
Turnbull, E. ..... West Hartlepool.
Turnbull, T. J. ..... North Shields.
Tweddle, G. Markham ..... Stokesley.
Twizell, John F. ..... North Shields.

Vermehren, H. W. M. ..... Newcastle.
Vint, Robert ..... Sunderland.

Waddington, Thomas ..... Newcastle.
Wailes, George ..... Newcastle.
Wailes, W. T. ..... Newcastle.
Wait, James, jun. ..... North Shields.
Wait, John, jun. ..... North Shields.
Wake, W. M. ..... Sunderland.
Wallis, Robert, M.R.C.S. ..... Stocksfield.
Wardell, Rev. W. H. ..... Winlaton Rectory.
Wareham, Fras. Tindle ..... Durham.
Warwick, John ..... Newcastle.
Watson, Henry ..... Milfield House.
Watson, J. C. ..... Heworth Lodge.
Watson, Joseph, jun. ..... Bensham Grove.
Watson, Mason ..... Newcastle.
Watson, R. S. ..... Newcastle.
Watson, T. E. ..... Newcastle.
Watson, Thomas ..... Newcastle.
Watson, W. J. ..... Bensham Grove.
Waugh, John Grey ..... London.
Wayman, John Wright ..... Sunderland.
Webb, F. M. ..... Birkenhead.
Welford, George, M.R.C.S. ..... Sunderland.
West, Tuffen, F.L.S. ..... Frensham.
Wheeler, Rev. R. F. ..... Whitley.
Wheldon, John ..... London.
Widowfield, Frank ..... Houghton-le-Spring.
Wilcox, W. E. ..... Whitburn.
Williams, James ..... Sunderland.
Williamson, John ..... South Shields.

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Williamson, Sir Hedworth, Bart., M.P. Whitburn Hall.
Wilson, Charles..... Shotley Park.
Wilson, E. J..... Gateshead.
Wilson, Henry ..... South Shields.
Wilson, John..... North Shields.
Wilson, Joseph ..... Newcastle.
Wilson, Joseph ..... Cleadon Hall.
Wilson, Robert, M.D. ..... Alnwick.
Wilson, R. H., M.D. ..... Gateshead.
Wilson, Thomas ..... Newcastle.
Wills, Rev. James..... North Shields.
Wood, Edward, F.G.S..... Richmond.
Wood, John ..... Durham.
Wood, Lindsay ..... Hetton.
Wooster, David..... Wallington.
Wright, G. H. ..... Hetton.
Wright, Joseph, jun. ..... South Shields.
Wright, William ..... Westoe.

Yellowley, Henry ..... Newcastle.
Youll, John G. ..... Newcastle.
Young, Charles Henry..... Newcastle.
Young, Emmanuel ..... North Shields.
Young, Oliver ..... Newcastle.
Young, Thomas..... South Shields.
Young, W. J. ..... Seaham.

HONORARY MEMBERS.

Airey, G. B., F.R.S..... Greenwich Observatory.
Bate, C. Spence, F.R.S. ..... Plymouth.
Glaisher, J., F.R.S. ..... Lewisham.
Jones, T. Rupert, F.G.S..... Farnborough.
Mennell, H. T., F.L.S..... London.
Oliver, Daniel, F.R.S. ..... Kew Gardens.
Phillips, John, F.R.S. ..... Oxford.
Perkins, V. R. ..... Wooton-under-Edge.
Sedgwick, Adam, F.R.S. ..... Cambridge.

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REPORT OF THE COMMITTEE

OF THE

NATURAL HISTORY SOCIETY,

PRESENTED AT THE

ANNIVERSARY MEETING, MAY 9TH, 1867,

D. EMBLETON, ESQ., M.D., IN THE CHAIR.

Your Committee have to report that the general operations of the Society have been carried on with the same amount of success as that by which they have been attended for some years past, and that the lack of incident during the period to which it is their duty to refer, renders any lengthy commentary unnecessary.

The scientific meetings of the Society, resumed in connection with the Tyneside Naturalists' Field Club, have been a satisfactory addition to the year's programme, and the popular Winter Evening Meetings have as usual years been amongst the pleasantest réunions of the season.

The number of members has somewhat diminished since the last Anniversary, those removed from the list, by death and other causes, being somewhat in excess of the number of new elections.

The Society has to deplore the loss during the past few months of two of its most distinguished members, Joshua Alder and Prideaux J. Selby, both of them associated with the Society ever since its foundation, and at the last, both of them Vice-Presidents. As an outline of the life and scientific labours of Mr. Alder has already been sketched for the Transactions by loving and appreciative hands, your Committee need only express their deep sense of the loss incurred by his removal. Up to the last his thoughtful care over the interests of the Society was daily manifested.

Mr. Selby's connection with the Society had been lessened by

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increasing age, and for many years he had been little seen amongst us; but he was an active member in its early days, and contributed several papers to the quarto volumes of Transactions, the most important of which was the "*Catalogue of the Birds of Northumberland and Durham.*" He was best known to the scientific world in connection with his fine work on British birds, and his name appeared to the last as one of the conductors of the "*Annals and Magazine of Natural History.*"

The Museum has been much enriched during the past year, chiefly by presentation. Purchases have been confined to a set of plaster models of Fungi, of Italian manufacture, and a series of Dr. Anton Fritsch's models of Foraminifera, both of which are now in the Museum.

The Herbarium of the Society has been augmented by Sir W. C. Trevelyan's gift of a large collection of British plants, which is now in course of arrangement with the previously existing British Herbarium.

Through the ever-watchful kindness of Sir W. G. Armstrong, the whole of the Natural History collections, and scientific library of the late Joshua Alder, have become the property of the Society, and cabinets for their reception are in course of construction. It is impossible to over-estimate the value of these collections to the Society from their close connection with the marine zoology and zoological literature of the North of England.

The general list of donations, subjoined to the report, will be found similar in extent to those of former years and calls for no special remark.

The Museum retains its attractions for sight-seeing visitors to the town, and the income from this source is a pleasing feature in the Treasurer's report. About sixteen thousand persons, chiefly of the working classes, represent the amount set down for payments at the door.

The Treasurer's statement is appended to the report, and shows a satisfactory state of the funds of the Society. The floating debt has been further diminished since the last Anniversary Meeting, and your Committee trust that ere another year is past, it may be entirely extinguished.

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RALPH BROWN, ESQ., TREASURER, IN ACCOUNT WITH THE NATURAL HISTORY SOCIETY,

FROM THE 1st JANUARY, 1866, TO THE 31st MARCH, 1867.

Dr.	£	s.	d.	Cr.	£	s.	d.
To Balance from last Acc.	103	12	6	By Keeper's Salary	93	15	0
" Subscriptions from Members	213	3	0	" Sundries, per Wright	51	12	4
" Ditto from Associates	23	15	0	" J. Clayton, Esq., for Interest and Arrears	300	0	0
" Amount received for Admissions	146	10	2	" Tradesmen's Accs. ...	40	5	10
" Fine Arts Society ...	34	12	0	" Fire Insurance	12	10	0
" Lit. and Phil. Society	40	0	0	" Treasurer of Tyneside Nat. Field Club, for part Expenses of "Transactions" ...	48	8	9
" Mining Institute.....	20	0	0	" R. Howse, for purchase of Permian Fossils and Collection of British Shells	20	0	0
" Donations towards Building Fund	38	0	0	" Balance	55	0	9
" W. T. Moor, rent for Signboard.....	2	0	0				
	£621	12	8		£621	12	8
1867.—April 1st. To Balance in hands of Treasurer	£55	0	9				

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LIST OF DONATIONS TO THE LIBRARY AND MUSEUM

OF THE

NATURAL HISTORY SOCIETY,

FROM APRIL, 1866, TO APRIL, 1867.

Nos. 1 and 2 of the illustrated Catalogue of the Museum of Comparative Zoology, Harvard College, Cambridge, U.S.A.
Professor L. Agassiz.

Proceedings of the Zoological Society of London, 1865. *The Society.*

Transactions of the Imperial Royal Botanico-Zoological Society of Vienna, 1865. *The Society.*

Annual Report of the Smithsonian Institute, 1864. *The Institute.*

No. 2, Vol. II, of the Transactions of the Academy of Science, St. Louis, U.S.A. *The Academy.*

Transactions of the Academy of Science, Chicago, U.S.A., Vol. I.
The Academy.

Reports on the Materials for a Medical and Surgical History of the Rebellion in the U.S.A. *The Surgeon General, U.S. Army.*

Memoir on the Development of the Skull in the Ostrich Tribe, by W. K. Parker, Esq., F.R.S. *The Author, per H. B. Brady, Esq.*

Parts 1 to 6 of the Liverpool Naturalists' Journal.
The Secretary Liverpool Naturalists' Field Club.

Report of the Montrose Natural History and Antiquarian Society, 1866.
Robert Barclay, Esq., Secretary.

On the Ballast Flora of Northumberland and Durham, by John Hogg, Esq., M.A., F.R.S., &c. *The Author.*

On a Collection of Fossil Vertebrata from Jarrow Colliery, Kilkenny, by Professor Huxley, F.R.S., and Dr. E. P. Wright, F.L.S.
Professor E. P. Wright, F.L.S., Dublin.

On a new Genus of Alcyonidæ, by Dr. E. P. Wright, F.L.S.
Professor E. P. Wright, F.L.S., Dublin.

Contributions to a Natural History of the Teredidæ, by Dr. E. P. Wright, F.L.S. *Professor E. P. Wright, F.L.S., Dublin.*

The Natural History Collections and Scientific Library of the late Joshua Alder, Esq. *Sir W. G. Armstrong, C.B.*

A Human Skull from Rothwell, Northamptonshire.
Mr. H. J. Heighton, Kettering.

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Stuffed Specimens of the Common Grouse (*Tetrao Scoticus*).
W. J. Newall, Esq., per R. S. Newall, Esq.

A Number of Skins of British Birds. *Rev. J. F. Bigge, M.A.*

Two Skins of the Eagle Owl (*Strix Bubo*), male and female, shot near Stavanger, Norway.
Mr. Rier Riersen, Stavanger, per J. H. Richardson, Esq.

A Specimen of *Antennarius marmoratus*, from the Gulf Stream.
B. S. C. Clarke, Esq., Stannington.

A Specimen of *Hippocampus*, sp., from New Zealand.
Mr. W. Moreton, Blenheim Street.

A Number of Snakes and a Scorpion, from Madras.
Captain Massey, Ship "Cicero."

A Centipede, taken in a Ship on the Tyne.
Mr. W. Wright, Howard Street.

Two Specimens of *Comatula rosea*, from the north-coast of Scotland.
D. O. Brown, Esq., Jarrow Hall.

A Number of Specimens of Shells and Corals, from the north coast of Scotland. *D. O. Brown, Esq., Jarrow Hall.*

Specimens of *Helix aspersa*, and *Helix ericetorum*.
Mr. G. Hall, Alma Street.

A Collection of Plants, from the Pyrenees. *Sir W. C. Trevelyan, Bart.*

A Collection of British Plants. *Ditto.*

A large Series of British Seaweeds. *G. S. Brady, Esq., Sunderland.*

Four Specimens of Fossil Star Fish, from the Millstone Grit, Weardale.
Mr. Duff, Bishop Auckland.

Fish Remains, from the Old Red Sandstone, Stromness and Sandwick Glebe Quarry. *D. O. Brown, Esq., Jarrow Hall.*

Fossils, from the Millstone Grit, near Hexham.
Mr. W. Dinning, Gateshead.

An undescribed Vegetable Fossil, from the "Low Main," Newsham Colliery.
Mr. Thomas Atthey, Gosforth.

Four Palates of *Ptychodus*, from the Chalk, Hitchen.
Mr. H. J. Heighton, Kettering.

Specimen of Emerald, from near Christiania, Norway.
Richard Cail, Esq.

A Collection of Minerals, from Australia.
W. Arras, Esq., Warwick Bridge.

Two Specimens of Iron Ore, from Kettering, Northamptonshire.
Mr. H. J. Heighton, Kettering.

An Indian poisoned Dagger. *Miss Dawson, Eldon Square.*

A Maori Axe, from New Zealand. *Mr. W. Moreton, Blenheim Street.*

A Miner's Pick, and a Portion of a Candle, found in an Old Working, at the Rabbit Banks, Gateshead. *Messrs. J. H. Richardson & Co.*

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OFFICERS OF THE NATURAL HISTORY SOCIETY,

1867.

PATRON.

His Grace the Duke of Northumberland.

PRESIDENT.

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PROPOSED MEMORIAL

OF THE LATE

JOSHUA ALDER, ESQ.

At a Public Meeting, held in the Museum, Newcastle-upon-Tyne, March 23rd, 1867, Isaac Lowthian Bell, Esq., in the chair, the following resolutions were passed:—

On the proposal of Dr. Charlton, seconded by the Rev. A. M. Norman—

"That this meeting, deeply lamenting the loss which the cause of Natural History, and particularly its followers in the north of England, have sustained by the death of Mr. Alder, resolves, that in commemoration of his life-long devotion to science, his rare attainments in those departments which he himself especially cultivated, and the valuable aid and encouragement which he never ceased to give to all students of nature, and particularly to the Natural History Associations of his own district, it is desirable to institute a Memorial, to be called by his name, and that a subscription for that purpose be forthwith opened."

On the proposal of the Rev. George C. Abbes, seconded by James Clephan, Esq.—

"That the interest of the fund thus raised be applied, in general accordance with the recommendations of the joint Committee (subject to such modifications as a meeting of subscribers may determine upon), to the periodical presentation,

"First.—Of a sum of money to assist the researches of some deserving local naturalist, and

"Secondly.—Of a gold medal to such other naturalist as shall appear from the value of his work to be most deserving of the distinction."

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Proposed by JOHN HANCOCK, Esq., seconded by W. H. BUDDEN, Esq.—

"That the following gentlemen, together with the members of the Committees of the NATURAL HISTORY SOCIETY OF NORTHUMBERLAND, DURHAM, AND NEWCASTLE-UPON-TYNE, and the TYNESIDE NATURALISTS' FIELD CLUB, form a Committee, to take steps in furtherance of the object:—

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Proposed by H. T. MENNELL, Esq., seconded by Dr. EMBLETON—

"That John W. Pease, Esq., be appointed Treasurer to the fund, and that the Secretaries of the NATURAL HISTORY SOCIETY and of the TYNESIDE NATURALISTS' FIELD CLUB be requested to act as its Secretaries."

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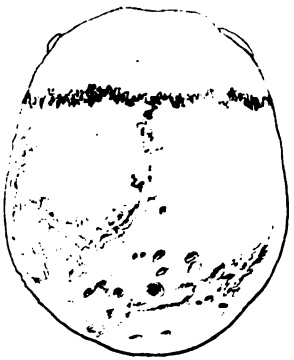

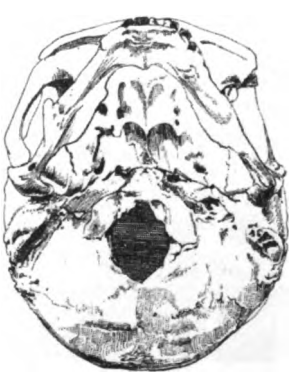

ANCIENT BRITISH SKULL.

Liderton. Northumberland.

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Fig.2.

Fig.1.

Fig.4.

Fig.3.

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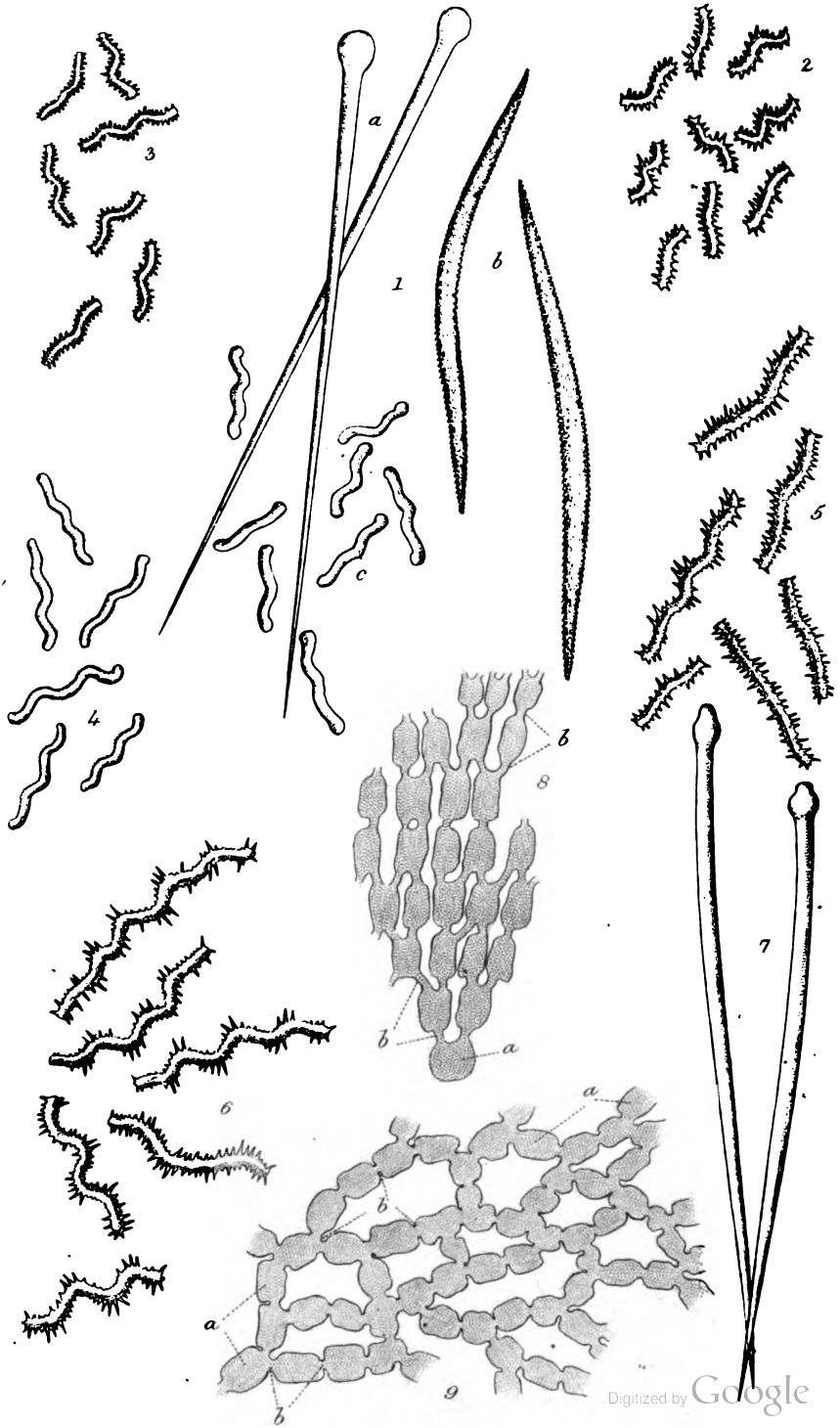

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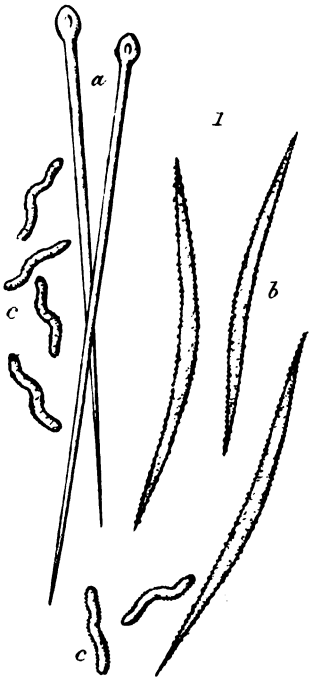

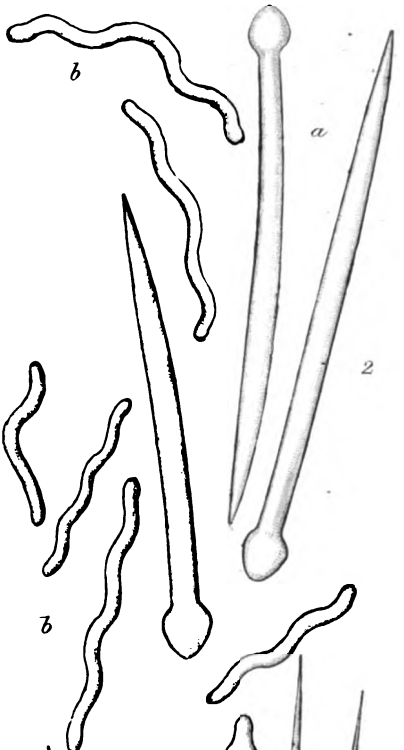

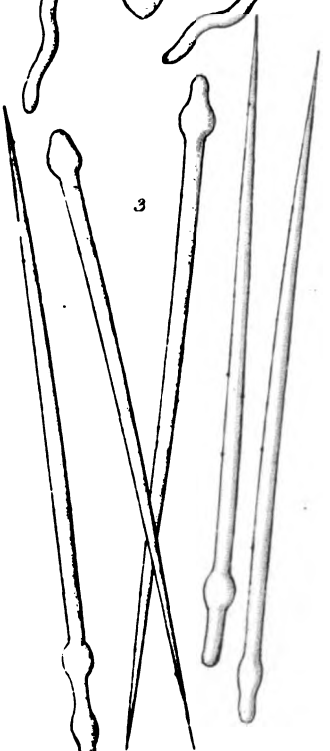

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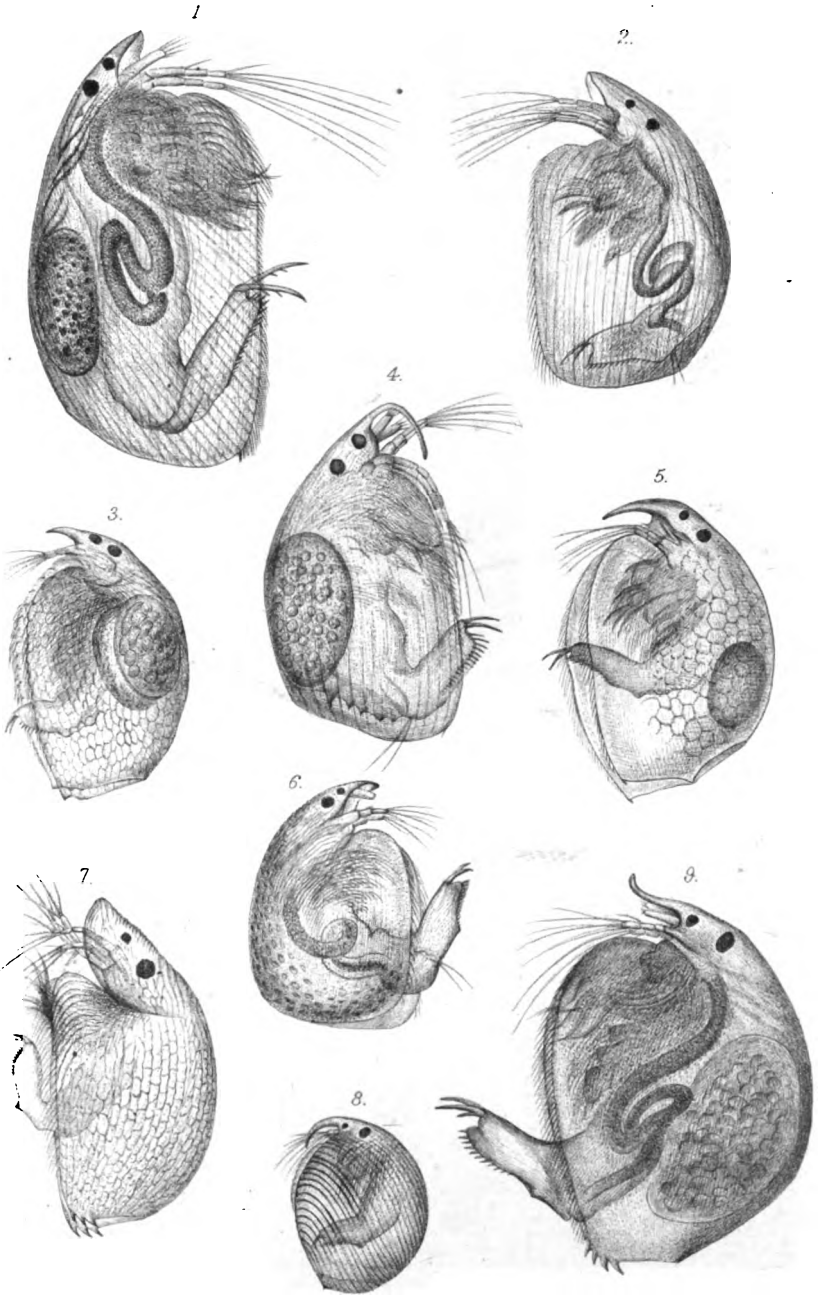

1. *Lyncæus clavicaudatus* ×84.
2. " " ×84.
3. " " ×84.
4. *Lyncæus bicalcaratus* ×170.
5. " *brevis* ×84.
6. " *angulatus* ×170.
7. *Lyncæus truncatus* ×84.
8. " " ×84.
9. " *macrodactylus* ×84.

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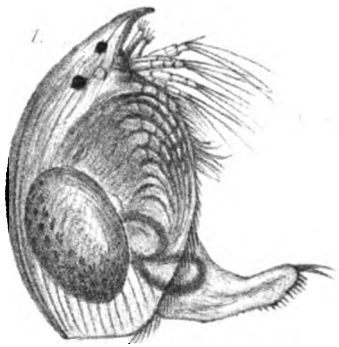

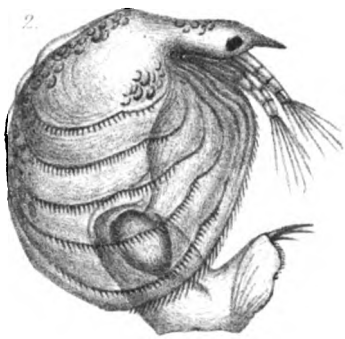

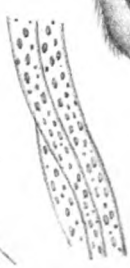

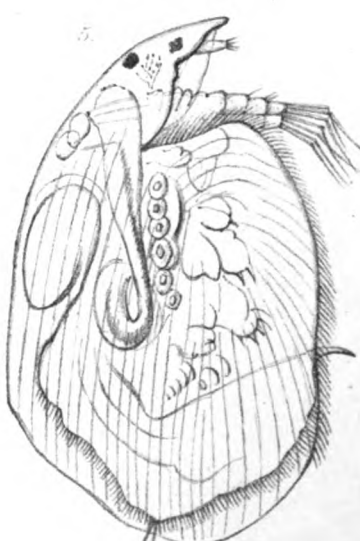

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1. Lacynius testudinus, Brady. 2. Lacynius truncatus, Brady. 3. Lacynius acanthus, Brady.
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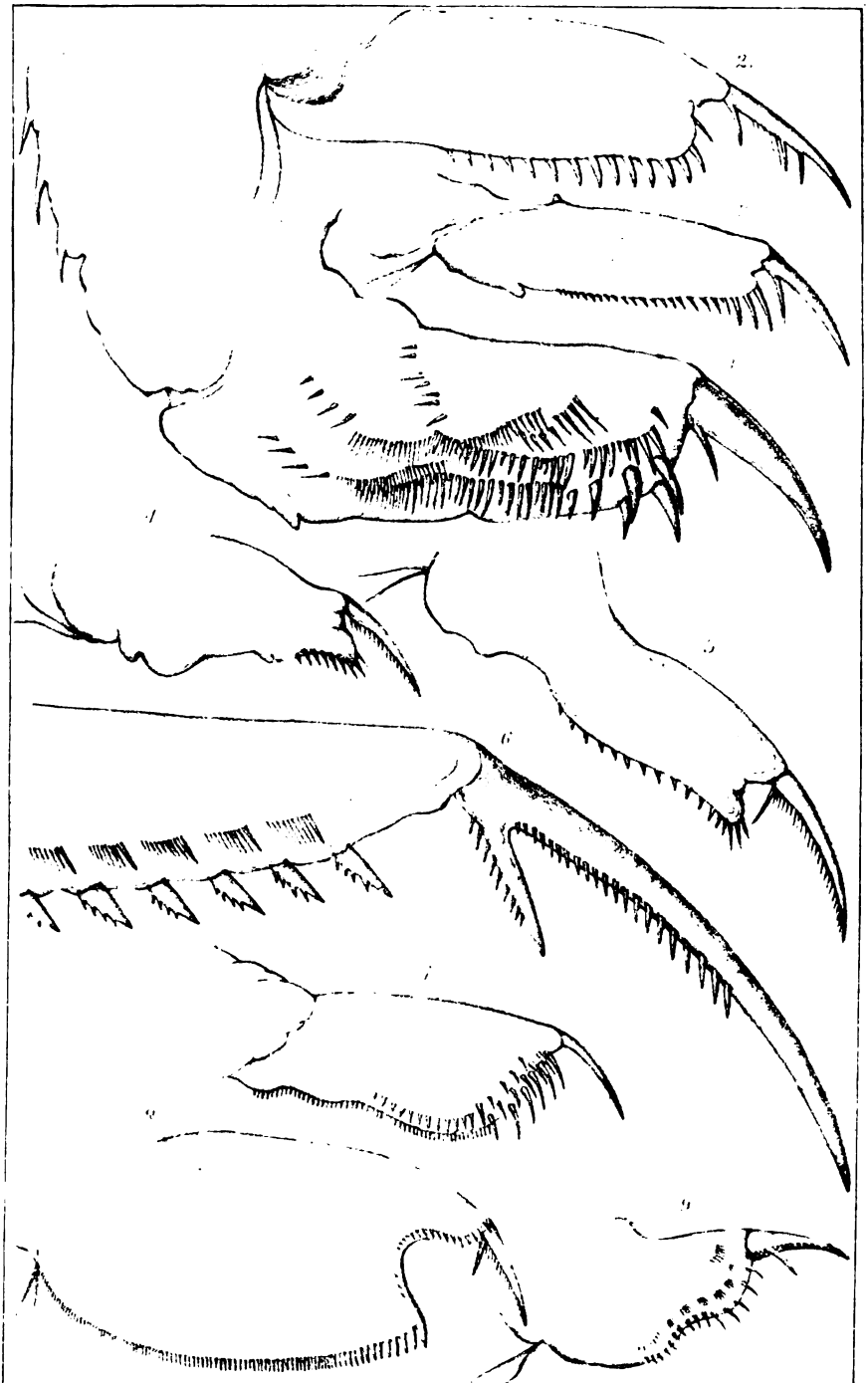

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1. Lyncus falcatus. 4.10
2. " elevatus. 2.10
3. " [illegible]
4. Lyncus [illegible]
5. [illegible]
6. [illegible]
7. Lyncus [illegible]
8. [illegible]
9. [illegible]

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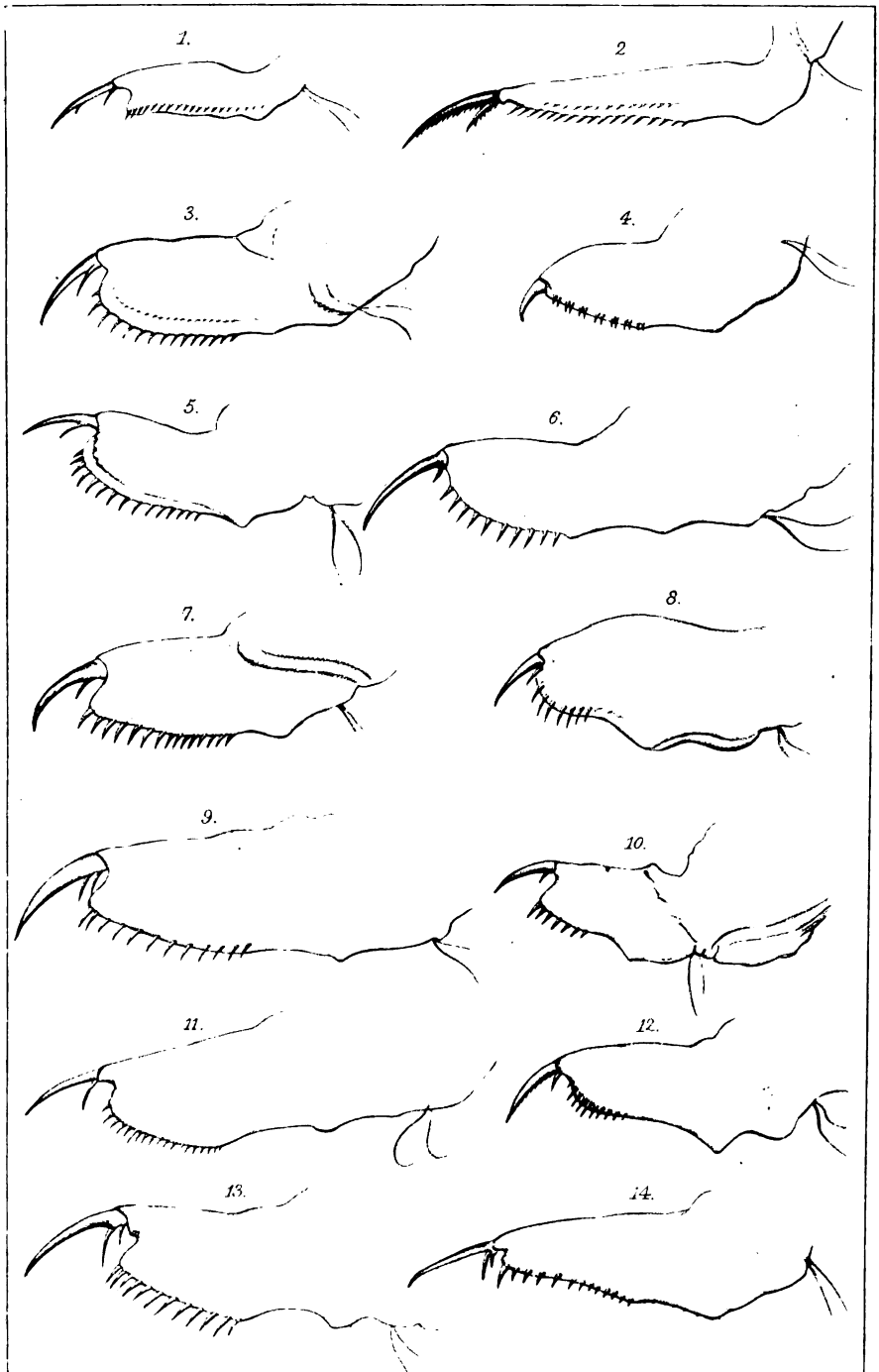

1. Lyncæus brevirostris.
2. " macrourus.
3. " setiger.

6. Lyncæus reticulatus.
7. " falcatus.
8. " crassus.

11. Lyncæus tricuspidatus.
12. " affinis.
13. " curvirostris.

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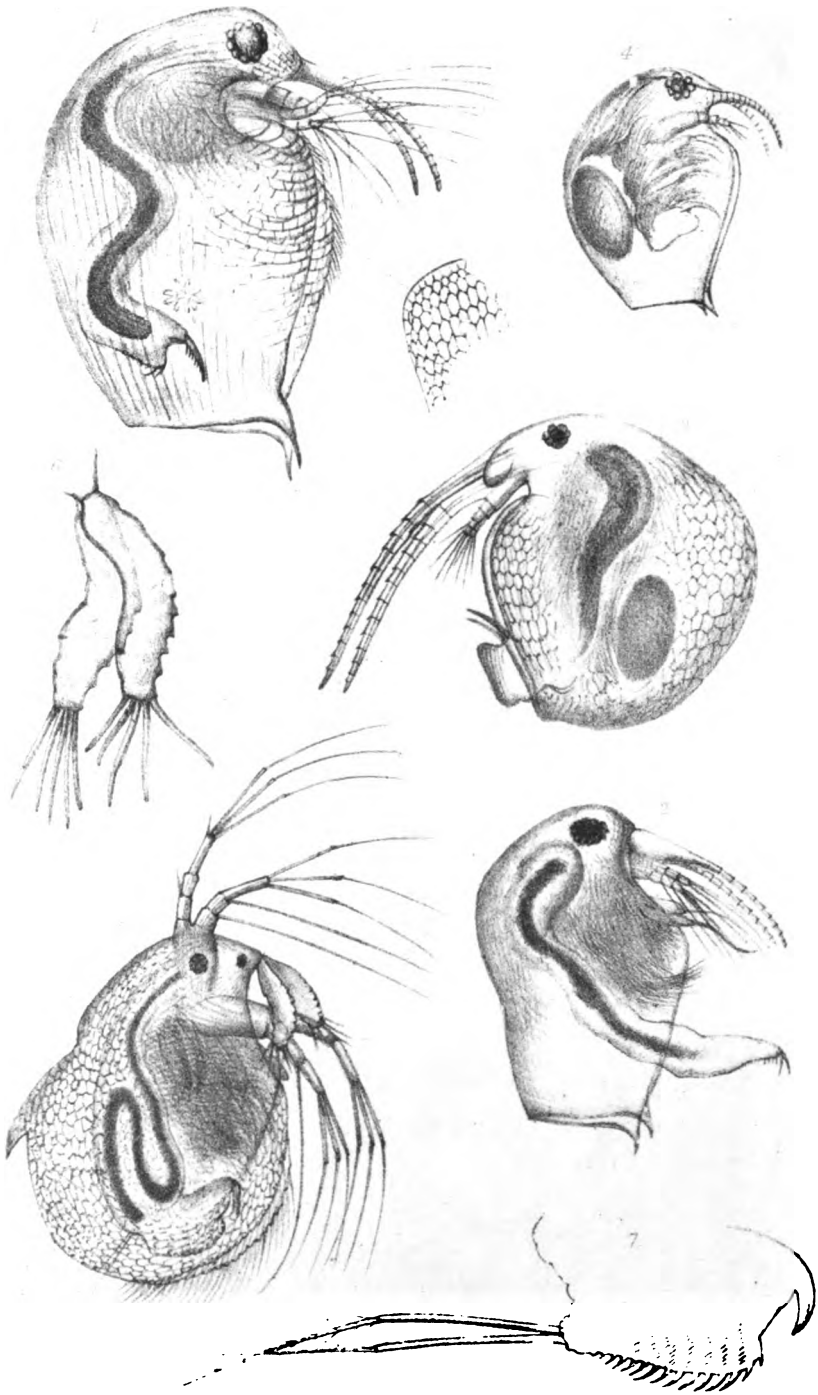

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